COAL AGE

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THE decision of the U. S. Supreme Court, approving the Employers' Liability Law, marks an epoch in labor legislation. Its sole interest and importance to coal men is in the shadow it casts before. No recent act so clearly betokens the trend of thought pertaining to our social problems, as does this ruling of our highest national court.

True! this law was designed principally to deal with our great railroads, and affects interstate labor only; however, to quote the Supreme Court decision: "The laws of the States, in so far as they cover the same field, are superseded, for necessarily that which is not supreme must yield to that which is."

Legislators in every state now have a definite and accepted ruling laid before them. Therefore, with this decision to guide them, is it not likely that lawmakers will create measures in behalf of intrastate labor, exactly paralleling the approved Federal Act governing interstate employment unless indeed those vitally interested show due concern for the passage of more equitable egislation?

The law as approved by our highest tribunal makes employers of interstate labor liable for accidents to employees whether the mishap is due to negligence on the part of the victim, or is caused by a coemployee. Such a liability law enacted and enforced in a coal state, would mean bankruptcy to three out of every four companies, should a disastrous explosion or fire occur at any one of their mines. Under such a liability law, there would be no reasonable limit to the burden which could be assessed by a jury on the defendant

Coal operators can no longer afford to evade the issue. The problem of a proper accident provision for industria workers cannot be ignored. The question is, Can we not secure fair and uniform compensation laws that will provide for a miner and his family 'n case of accident or death, and yet permit the stricken company to recover and continue in business?

The blackest stain on the coa' industry has come from the deceit and perjuries accompanying accident investigations. It is nearly always the same old story—a coroner's jury composed o farmers, doctors or some other class of men who never saw the inside of a coal mine, and then the usual verdict, "caused by a blown-out shot." This deplorable condition is an outgrowth of unjust laws. The operator chooses the only course that will avoid financial disaster, and strives by fair or foul to avoid conviction.

That present laws are ineffective is proved by the reports from employers' liabilities companies, which show that of all the accidents reported to them, only one in eight led to a settlement. Under the law's technicalities, any effort on the part of the coal company to settle, is sure to be presented to a jury as evidence of guilt Last but not least, the relations of operator and miner under the present act are constantly embittered,, and this lack of harmony is not calculated to restrict the number of accidents.

The United States is practically the only country that retains the principle of an employers' liability law. Other nations have adopted some form of compensation act, based on the idea that injuries to men, like accidents to machinery and buildings, should be imposed on the employer. One is as much an expense of production as the other.

When this principle is adopted, the mining company can shift the risks of compensation to an insurance company, which, for a reasonable premium, will carry this hazard for them. The insurance company, to operate with success, would have to vary its premium on each mine in accordance with a fixed standard of safety. The charges to operators of mines having many natural dangers would be greater than to companies operating in comparatively safe seams.

In this way, a just tax would be placed on each coal company; present uncertainties would be removed through the operator's knowing beforehand what definite compensation charge he must add to his cost of mining; insurance companies could form a more precise idea of the charges they might be compelled to pay, and thus place their business on a scientific basis; and lastly, the injured workman and his family would receive all the compensation paid over by the employer and the insurance company, instead of having 47 per cent. of the money go to enrich a class of lawyers properly dubbed "ambulance chasers." In a later issue, we will discuss the plan of voluntary compensation as adopted by the H. C. Frick Coke Company.

European Wash House Practice

Special Correspondence

The first of a series of articles to be published on this subject. The question is discussed here along general lines, while the succeeding papers will deal with the problem in greater detail.

It has long been a recognized fact that the occupation of mining, both in metalliferous and coal mines, must be ranked as one of the callings involving a considerable amount of physical discomfort and uncleanliness. And further, there is no doubt that in the past a great proportion of the sickness and loss of time among operatives is traceable to the fact that the miners on leaving work were not provided with adequate means for bathing and washing. No suitable arrangements were provided whereby they could change their wet and dirty clothes for garments more suitable for exposure to the outside air.

Many of these miners have to travel considerable distances to their homes and in the case of married men, the size of the house and the presence of other inhabitants interferes with the bathing arrangements, with the result that the percentage of mortality must have been materially increased. Cases of phthisis and similar complaints are at the present day far too common, and although mining companies are frequently most generous in the provision of medical attendance, it is obvious that the root of the trouble lies deeper and that the true remedy of the problem is in preventive, rather than curative means.

For this reason, in Europe, and especially in France, Germany and Belgium, the question of providing adequate washing, bathing and clothes drying appliances is receiving considerable attention and some remarkable installations have been made to which attention may here be drawn.

Referring to the types of appliances available for such purposes, one may first of all consider the question of proper change of apparel. The miner, on coming up from the warm and usually damp workings of the mine, finds, unless he is properly protected, a blast of cold bleak air meeting him, often accompanied with rain or snow, and these conditions are aggravated by the fact that he has either to walk or ride some distance before he reaches his home. For this reason some form of dressing accommodation is urgently necessary.

Clothes Suspension Method

Two types of such plant exist in Europe. The first of these consists of a large hall with benches on which the workmen sit while changing clothes, the hall being given considerable elevation and suitably warmed. In the upper part of the hall is suspended a rack arrangement furnished with a number of pulleys corresponding to the total number of employees in the mine. Over these pulleys work metallic cords carrying at one end a hook or other form of gripping appliance to which the wet garments can be attached. At the other end is a counter weight and locking device whereby the clothes can be hauled up into the roof and locked in position, the key of the lock being retained in the possession of the workman owning the clothes.

A current of warm air circulating through the building, dries the clothes and thoroughly aerates them, removing contaminating influences; the pulleys are spaced a sufficient distance apart to provide free room round each set of clothes for the circulation of air. The workman, on coming to work, after passing the time

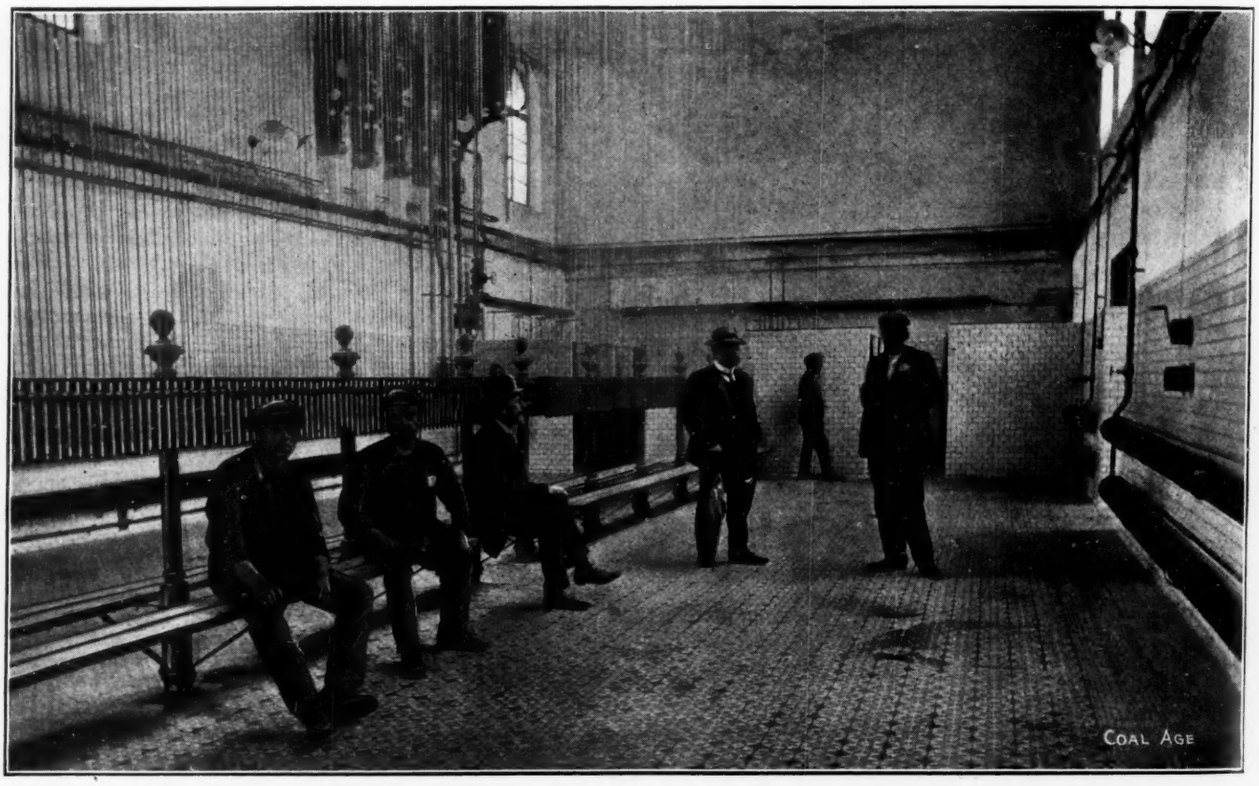

Fig. 1. Dressing Room and Clothes Hoist at the Poirier Mines

check office, comes into the dressing hall, brings down his dry working clothes, changes, hangs on the hook his ordinary garments and hauls them up locking them in their position in the roof.

On return from the mine, he enters the dressing hall, often by means of a covered way from the pit mouth, so as to prevent the access of cold air to the heated body. After washing in the appliances to be described shortly, he brings down his dry clothes, changes, hangs up the wet mine clothing, which will then be dry and ready for the next time he comes to work. In some establishments this arrangement is supplemented by a clothes-washing and drying plant whereby at suitable intervals the dirty mine clothes are washed and dried rendering them fit for further use. This type of plant is in extensive use particularly in Germany and Belgium.

Closets and Lockers

An alternative to this equipment which is to be found in some mines, is to use clothes chests or lockers. These are generally made of light steelwork frames, cased in with expanded metal, so as to permit at all times a free supply of air to circulate through the clothes. They are usually ranged round the sides of the dressing hall and each locker is furnished with a lock and key, the latter being in possession of the workman.

The usual dimensions of these lockers is 1.75 m. in height, 0.3 m. in depth, the same in width, and they are usually elevated from the floor by means of struts to a height of about 0.15 m. to 0.3 m. Sometimes they are divided into two compartments, the top one being reserved for hats, coats, etc., while the lower one is used for underwear and boots.

The dressing room and clothes hoists in use at the Marcinelle-Nord Colliery in Friesland belonging to the Fiestaux Pit of that company is shown on the front cover of this issue. It will be seen that the apartment is well lighted and warmed and that in all its arrangements it is capable of rapid and easy cleaning. The illustration Fig. 2 shows a section of the type of expanded metal lockers used in the alternative arrangement for this purpose. The possibility of adequate supervision and of proper hygiene is apparent. In Fig. 1 is shown a similar installation to that on the front cover, being a dressing room and clothes hoist at the St. Charles pit of the Poirier mines, installed by Goehmann & Co., of Brussels. This firm has installed about 80% of the dressing and bathing installations existing in Belgium, France, Germany, Russia, Spain and Austria in connection with mining equipments.

Bathing Arrangements

An equally important and perhaps even more important branch of the subject is the question of baths and washhouses. The average miner's home is not well equipped for the complete bathing necessary after the arduous toil to which the operator is subjected, and the methods adopted on the Continent are therefore of interest in this connection.

A considerable amount of thought is of course necessary in order to provide adequate accommodation for a large number of men at one time without running up the expense of the installation to an unreasonable figure, and therefore simplicity combined with efficiency is the keynote for such work. At the same time, it is astonishing to what a degree of comfort it has been found possible to bring the bathing accommodation both for men and women employed in the colleries of Europe. Hot and cold water is usually available, and in some cases, especially for the engineers and senior officials employed in the mine, full baths are provided. Where these are not available, however, shower baths are used and washing operations can be conducted in privacy by means of brickwork cells closed with curtains or screens.

Through the courtesy of Messrs. Goehmann & Co., we are able to show several illustrations of such equipments. In Fig. 4 for example, is a view of the exterior of the building devoted to the spray baths and dressing room at pit No. 17 of the Monceau-Fontaine Colliery in Belgium. The interior fittings of such installations may be judged by Figs. 5 and 6 showing respectively the spray baths and lockers at the Fiestaux pit, and the spray baths for the miners at the St. Charles pit of the Marcinelle-Nord and Porier collieries.

The cells are usually constructed in glazed white tiles which are of great hygenic advantage, do not discolor, resist the influence of weather and frost, and are simple and practical to use. They are plastered on to the structural work by means of cement mortar, and in order to give the free standing walls a special resisting power, a lining of bands of iron running horizontally are usually placed in each layer or in every third or fourth layer. If shaped tiles are used at the ends of the walls, the ends are propped up with vertical iron bars or gas piping bedded into the ground at their lower end. The crevices of the walls are filled in with white marble, cement or cement mortar.

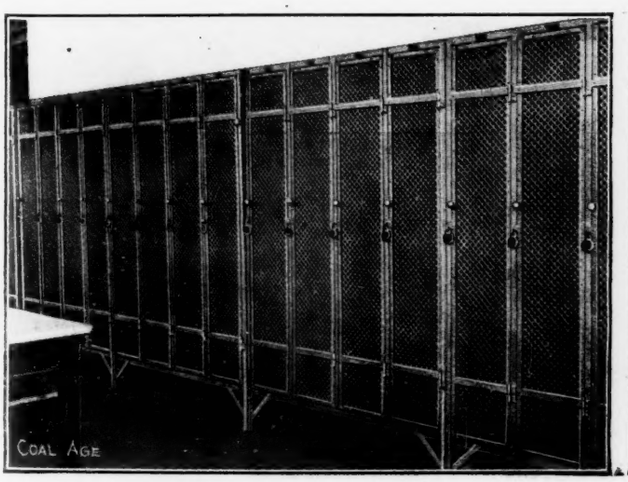

FIG. 2. EXPANDED METAL LOCKERS

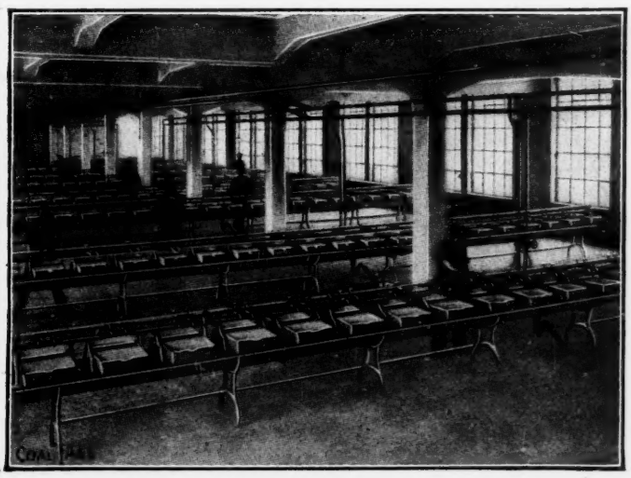

FIG. 3. WASH HOUSE WITH BASINS

Comparison of Method

An alternative method is to use enamelled brick and in order to show the relative extent to which the various methods enumerated above are adopted, Table 1, is attached giving a few of the principal collieries which have adopted dressing rooms and wash-houses.

The first column gives the number of workers provided for in the clothes hanging appartus in the roof of the dressing

halls and the second gives the number of workers for which lockers are provided. The third column gives the shower baths built of enamelled brick, and the fourth the shower baths built of tile in the manner above described.

TABLE I

	Dressing Hall	Wash Houses		
Colliery	Hangers	Lockers	Enameled brick	Tile
Ougree-Marihaye..	650			40
Kessales ...	1100			57
Concorde ...	400	10	31	
Gosson	1472	24	79	
Patience ...	600		53	
La Haye....	1100			65
Bois d'Avroy	1157	40		86
Bonne-Fin ..	470	208		58
Abhooz	1084	77		76
Petite Bacnure		280		52
Cockerii ...	1000		63	
Est de Liege	400			42
Hasard	550	30	7	
Minerie	105			14
Bonnier ...		20	10	
Oignies Aiseau	300	30		36
Roton	1000	40	72	
Bois Communal ...	324		27	
Poirier	550	24	53	
L'Epine	250		25	
Marcinelle-Nord	600		72	
Monceau Fountain..	2578	808	479	
Fontaine-Leveque..	1100	24	102	
Anderlues ..	825		119	
Mariemont .			91	
Bois-du-Luc	800		80	
Levant Flenu			5	
Produits ...	30		14	
Levant-Produits ..			6	
Siege d'exp.			7	
Frameries.				
Fief		20	3	5
Nord du Rieu due Cœur.				3
Gr. Hornu..				29
Strepy-Bracquegnies..		416	52	

The illustration Fig. 7 shows an alternative method of securing privacy in the various shower bath cells by the use of enamelled sheet doors. Where expense is cut down to the finest point, wash basins provided with hot and cold water are used, as shown in the illustration Fig. 3. For heating the water four steam and two hot water boilers are used.

As a general rule the dressing hall and washing equipment are complementary to one another and are contained in the same building, inasmuch as one operation without the other is hardly satisfactory. As a typical example of the way in which such installations are arranged may be taken the equipment provided at St. Etienne mines of the Loire.

Equipment at the St. Etienne Mines

Four doorways are provided into the building, two leading to the subsidiary departments such as the store and lamp room, and two opening directly on to the dressing hall. The main hall has dressing accomodation for 500 workers. The miners in changing clothes divest themselves as completely as possible of their working outfit and then proceed to the shower baths immediately adjacent to the hall. The officials of the mine change and bathe in separate compartments, clothes lockers being provided for them. Urinals and water closets are provided, as are also the necessary boilers and apparatus for the heating system of the building and the hot water required for the baths.

At the other end of the building are subsidiary offices including naphtha stores, the lamp filling room, the lamp cleaning department, stores, and the lamp repairing room. In this way the miner is able to obtain and return his lamp in the same building as is provided for his dressing and washing accommo-

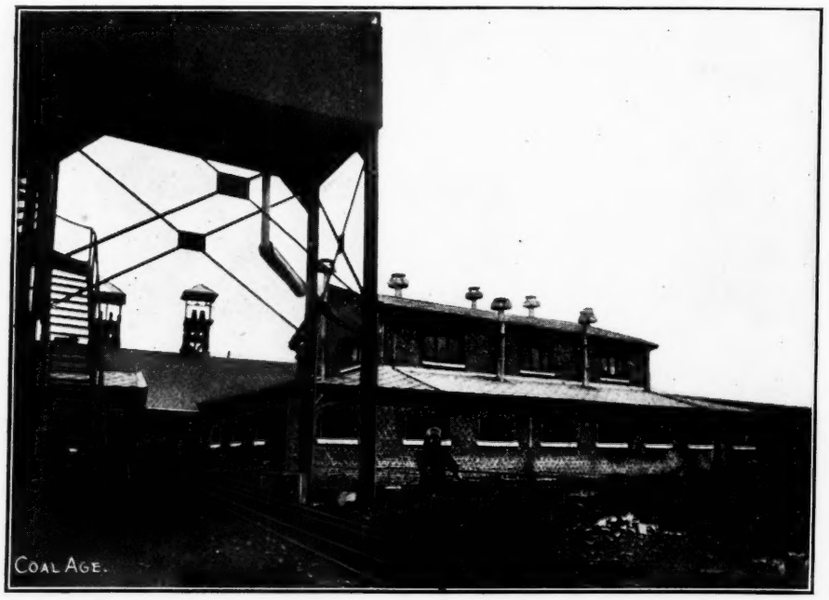

FIG. 4. EXTERIOR OF THE MONCEAU-FONTAINE BATH HOUSE

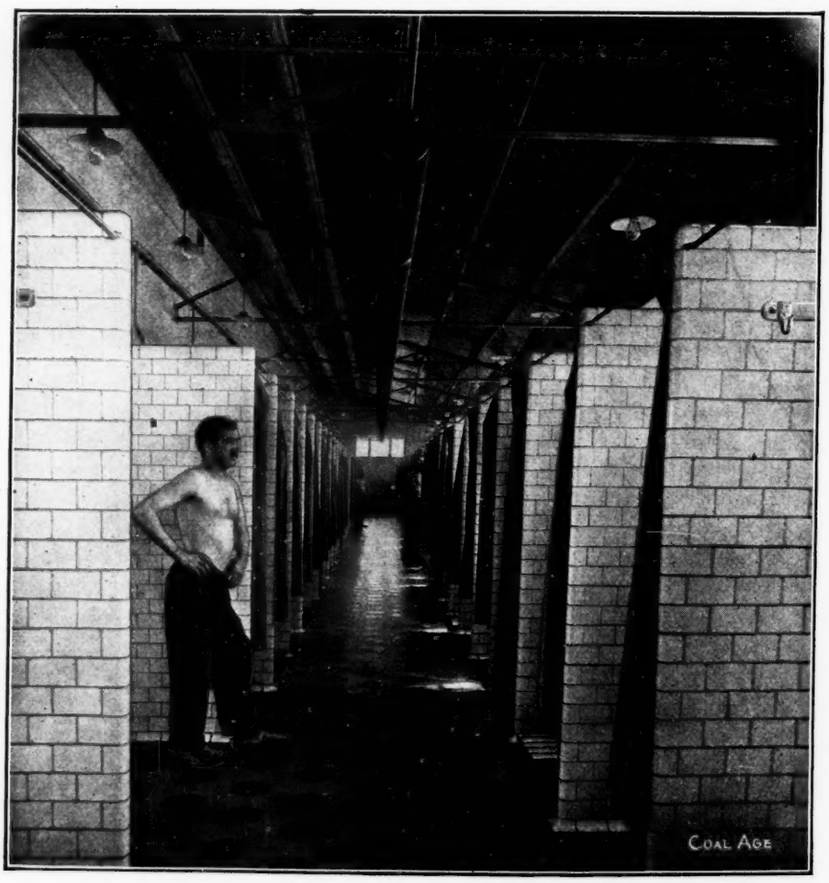

FIG. 5. SPRAY BATHS AT THE MARCINELLE-NORD COLLIERY

dation. Immediately over the lamp departments is another story, in which are two rooms devoted to the engineers' baths and dressing accommodation. In order to provide a free circulation of air extensive ventilation is provided on the Louvre system in the roof of the building, and in addition there are ventilating windows in the side of the structure.

In an article of this description it would be impossible to give a complete idea of the way in which bathing and dressing accommodation have been adopted on the Continent. It may, however, be said that almost without exception the facilities provided have been greatly appreciated by the workers who have availed themselves to a large extent of the equipment provided.

Whether such installations should be made compulsory and the use of them by the miners should be part of the obligatory routine of the mine is a matter of opinion. There is, however, no doubt that the provision of such accommodation in connection with collieries and mines is a step in the right direction, not only from the point of view of the worker, but also that of the employer, inasmuch as it leads not only to an increase of contentment with the conditions of employment on the part of the worker, but has a reflex action on the general health and efficiency of the operators. This has been found by experience to be a great asset to the working of such mines as have adopted the systems above described.

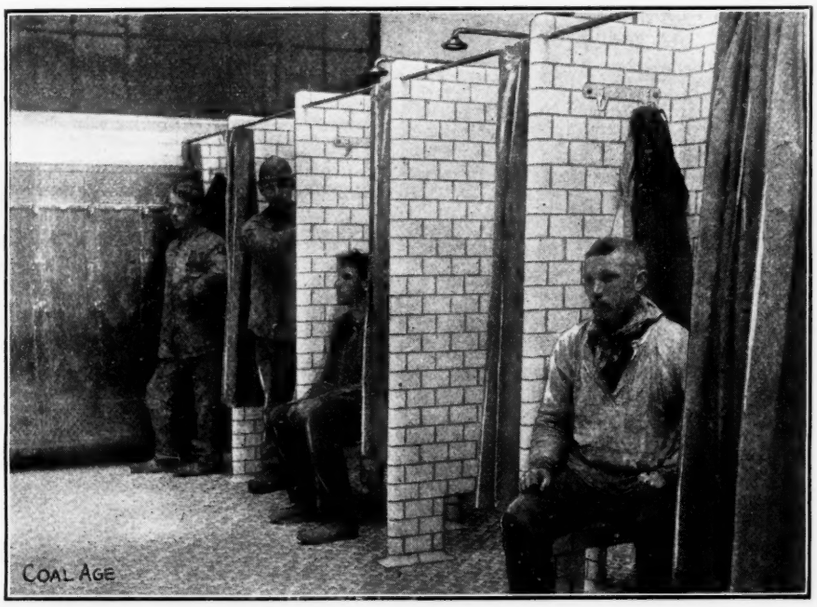

FIG. 6. LOCKERS AT THE POIRIER COLLIERY

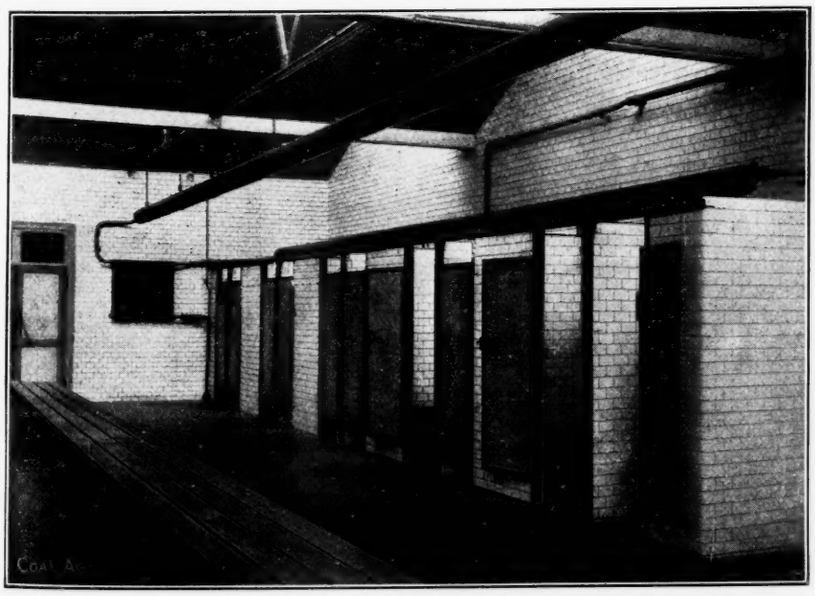

FIG. 7. BATHS WITH ENAMELLED SHEET DOORS

Mine Cave Commission

SPECIAL CORRESPONDENCE

The mine-cave commissioners who were recently appointed by Governor John K. Tener, of Pennsylvania, have made some progress in their investigation into mine subsidences in the anthracite region, and the damage resulting therefrom.

Recently the commissioners requested the director of the department of public works in the city of Scranton to inform them of the number of cubic yards of ashes and rubbish collected in Scranton during the year 1911. The bureau of engineering of the department of public works estimates that 108,016 cu.yd. of any given material will fill a 5-ft. bed extending over 13½ acres. That quantity of ashes and rubbish was collected and wasted during 1911 in Scranton.

These ashes will serve for the upper beds, but as the lower beds are much thicker than the upper a large amount of rubbish will be needed to replace them. Though this be conceded, it has been pointed out that most of the damage that results from mine caves is directly attributable to the subsidences in the beds near the surface.

LIST OF COMMISSIONERS

The following is a list of the commissioners: W. J. Richards, president, Pottsville; W. L. Connell, Scranton; E. J. Lynett, Scranton; W. A. Lathrop, Wilkes-Barre; George W. Davis, secretary, Lansford; Charles Enzian, Wilkes-Barre; W. L. Lewis, Pottsville; J. Benjamin Dimmick, Scranton; Reese A. Phillips, Scranton; Charles Stevens, clerk, Scranton.

The commission has decided to investigate the leases to ascertain what provisions are embodied in them in reference to surface rights. In some leases already examined by the commissioners, entire tracts of land are protected to the extent that, in the event of a mine cave, the property damaged must be placed in the same condition as it was previous to the disaster brought about by the cave that affected it.

It is the intention of the commissioners to do their work thoroughly. They regard the situation as serious, but not irremediable. Within a few hours of the commission convening, the children in school No. 23 of this city had to be dismissed; while on a previous occasion, when the mine commission was assembled here, a house in Ross Ave. was engulfed from roof to cellar.

Pathogenic Mine Atmospheres—III

By Edwin M. Chance*

Here are discussed the active pathogenic gases, as carbon monoxide, nitrogen peroxide, hydrogen sulphide and sulphur dioxide. The possibility of a skin inhalation of carbon monoxide is considered.

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Note—Abstracted reprint from Journal of Franklin Institute, November, 1911.

The presence of carbon monoxide in mine air may be traced to several sources. As it is a product of the incomplete combustion of carbonaceous substances, it is formed by explosions of coal dust or firedamp, by underground fires, and by the detonation of most explosives. It is well known that carbon monoxide is produced when air at ordinary temperature acts upon bituminous coal. It has remained, however, for Mahler and Denet to prove the presence of this gas in mine air from such a source. These writers have found as much as 0.004 per cent. of carbon monoxide in the air of well ventilated mines. The statement may be found in the literature that this gas is also produced by the decomposition of organic matter other than coal in the mine. As the presence of carbon monoxide has been considered indicative of mine fires, its presence from other causes must be given due weight before forming a definite opinion as to the existence of a fire.

Its principal claim on our attention, however, lies in its physiological action. As this gas is odorless and nonirritant, it may be breathed in considerable quantity without the subject being aware of the fact, the first warning being given by grave functional derangement. Briefly, the mechanics of its action may be thus described: Carbon monoxide, having an affinity for hemoglobin about 200 times greater than that of oxygen, readily replaces the latter in the blood when breathed. As the blood becomes saturated with carbon monoxide its oxygen capacity becomes correspondingly diminished, until it can no longer supply sufficient oxygen to fulfill the requirements of the organism. In addition to this, the gas is said to cause degeneration of the cells of the organism, and thus serious nervous disorders are brought about. Haldane and Douglass state that physical disablement is produced in man when about 50 per cent. of the blood is saturated with carbon monoxide, death occurring when this figure increases to 80 per cent.

Effect of Carbon Monoxide

Owing to its great affinity for carbon monoxide, the blood may become saturated to a dangerous extent when this gas is present even in minute quantities. It is difficult to give fixed points at which an atmosphere containing carbon monoxide will produce given effects. It has been stated, however, that quantities under 0.02 per cent. have no appreciable action on man, while the lethal percentage has been fixed at 0.5 per cent. Herman has tabulated the action of carbon monoxide as follows:

THE ACTION OF CARBON MONOXIDE

Percentage in air	Effects on man
0.05	After half an hour or more, giddiness on exertion.
0.1	After half an hour or more, inability to walk.
0.2	After half an hour or more, loss of consciousness and perhaps final death.
1.0	After a few minutes, loss of consciousness and final death.

When any given percentage of carbon monoxide is breathed, the blood tends to reach a degree of saturation at which the carbon monoxide and oxygen in the air are in equilibrium with the carbon monoxide in the blood. If we apply the law of mass action to this phenomenon, it will be readily seen that a change in the proportion of oxygen present will have an effect upon the system, carbon monoxide-oxygen-carbon monoxide hemoglobin, opposite in direction to that produced by a change in the proportion of the carbon monoxide. Now the data on which the statements as to its toxicity have been based have all been gathered when carbon monoxide was breathed mixed with air containing 21 per cent. of oxygen. Unfortunately, however, when carbon monoxide is met with in dangerous quantities in the mines, the oxygen percentage is, as a rule, far below the normal. It seems to the writer, therefore, that under such conditions far lower proportions of carbon monoxide than those noted would produce serious results. It is regrettable that we have but little real data bearing on this point. A case has been reported, however, in which several men lost their lives on entering an atmosphere containing 0.0023 per cent. of carbon monoxide and 4.874 per cent. of carbon dioxide. The oxygen percentage was not stated. As has been mentioned before, when considering the toxicity of an atmosphere, the action of no one of its constituents can be taken alone, but all must be considered together.

Animal Test for Carbon Monoxide

As carbon monoxide is poisonous to warm-blooded animals generally, its effect upon birds and mice has been taken advantage of to give warning of its presence. Haldane, who has been instrumental in bringing this test to the notice of mining engineers, uses these words in describing it:

"The principle of the test is as follows: In small warm-blooded animals the rate at which chemical changes occur in a given body weight is enormously greater than in large animals. Thus a mouse weighing about half an ounce consumes about fifteen times as much oxygen as half an ounce of the human body would consume in the same time. A reason for this difference is evident enough with bodies of the same shape and composition, but of different sizes; the surface increases as the square of any corresponding diameter, but the mass as the cube. The bigger an animal is, therefore, the less surface will it have for a given mass, and the less rapidly will a given mass of it lose heat to the environment; or the less heat, and consequently the less oxygen, will a given mass of it require in order to maintain the normal body temperature. Not only are the chemical changes in the small animal far more rapid, but the rate of respiration, circulation, etc., are correspondingly increased. It is difficult to count by the eye the rate of breathing in a mouse, and quite impossible to count its pulse rate. By a photographic method of recording the electrical changes which accompany the heart beat, Miss F. Buchanan, of Oxford, has recently shown that the pulse rate in mice and small birds is from 700 to 1000 per minute.

"It follows that the small animal will absorb any poisonous gas far more quickly than a man will, and will, therefore, show symptoms of poisoning far sooner. It can, in fact, be employed to show what will ultimately happen to a man if he remains in the poisonous air. This, and this alone, is the principle of the test. The small animal is not, in the long run, more sensitive than a man to a given percentage of carbon monoxide; indeed, the opposite is almost certainly the case."

Symptoms of Monoxide Poisoning

The symptoms of poisoning by this gas are varied. When small quantities are breathed there may be drumming in the ears, with more or less frontal headache and nausea. As the poisoning proceeds, giddiness and lassitude will set in, followed by progressive loss of power in the lower extremities, merging into paralysis, which eventually invades

the rest of the body. Synchronously with loss of muscular power the mental processes become deranged. Should the subject, however, inhale an atmosphere containing much carbon monoxide, almost instant insensibility will be the result. After recovery from exposure to this gas, severe pains in the head and extremities have been frequently noted; though a more serious after-effect is pneumonia.

The post-mortem appearances are characteristic. As carbon monoxide hemoglobin possesses a deep violet to cherry-red color, the face and lips have a remarkably fresh and lifelike appearance, very different from the bluish or livid pallor produced by a deficiency in oxygen.

COMPARISON OF THE PHYSIOLOGICAL ACTIONS OF AIR CONTAINING VARIOUS POISONS (LEHMANN).

Gas	Quantity causing rapid death	In ½ to 1 hour caused illness and danger to life	No serious effect in ½ to 1 hour	Slight symptoms after several hours
Sulphurous acid.....	.....	0.04—0.05%	0.005%	0.002—0.003%
Carbon dioxide.....	30%	about 6.0—8.0%	4.0—6.0%	2.0—3.0%
Hydrogen sulphide..	0.1—0.2%	0.05—0.07%	0.02—0.03%	0.01—0.015%
Carbon monoxide....	.....	0.2—0.3%	0.05—0.1%	0.02%

Effect of Nitrogen Derivatives

Nitrogen peroxide is one of the products of the combustion of certain explosives. It is extremely poisonous when breathed. Peterson and Haines state: "Habitually breathed in small quantities and great dilution, it produces severe chronic diseases. In acute poisoning, immediate dyspnea, tightness of chest, coughing, fainting, cyanosis, diarrhœa and collapse. Death within 40 hours, though symptoms of slight poisoning are delayed, in which case the first symptoms are headache, desire for fresh air, thirst, and then suddenly symptoms of aggravated character—distress of breathing, anxiety depicted on face, cold perspiration, prostruding eyeballs, and spasmodic coughing, followed by vomiting."

Effect of Sulphur Compounds

The presence of hydrogen sulphide in mine air may be brought about by the bacterial decomposition of organic matter, by the heating of coal by a mine fire, or by the action of organic matter on sulphates in solution. It is slightly heavier than air and possesses a strong odor, 0.01 per cent. being readily detected by the olfactory organ. This gas is even more toxic than carbon monoxide; it is stated that as little as 0.02 per cent. may have a toxic effect. Birds are especially sensitive to it, being killed by 0.05 per cent. "Breathed in its pure state, this gas is immediately fatal. It acts upon all animals through all tissues, especially the lungs. If somewhat diluted, it produces nausea, giddiness, cold skin, labored breathing, irregular action of the heart, pains in the stomach, and death by coma or in violent convulsions, with tetanus and even delirium. In greater dilution sleepiness will be produced, the continued respiration of the gas proving fatal, sensibility not being restored. In exceedingly dilute condition it sometimes occasions febrile symptoms somewhat resembling typhoid. Air containing 0.05 per cent. was the limit that men could breathe (Lehmann). Sometimes symptoms appear after a considerable lapse of time after breathing the gas, and they may continue for some days."

The presence of sulphur dioxide is probably one of the surest indications we have of the presence of a mine fire. Fortunately the gas is so suffocating that ample warning is given of its presence. Though notably toxic in its action, workmen exposed to the gas may establish considerable tolerance toward it.

A Suggested Danger in Helmet Work

While a great volume of material has been written on the subject of the requirements of a man equipped with breathing apparatus, it has occurred to the author that a most important phase of the matter has been neglected, namely, the insensible respiration. In addition to the oxygen absorbed through the lungs, the blood is continually being supplied with oxygen through the skin. Gerlach[1] states that the ratio of oxygen supplied by the skin to that supplied by the lungs is as 1 is to 137, while Regnault[2] and Reiset set the ratio at 1 to 180. Should the wearer of a breathing apparatus enter an atmosphere low in oxygen, the inconvenience caused by the curtailment of the supply of this gas through the skin would probably be negligible. Should, however, the atmosphere contain much carbon monoxide, there might be considerable cause for apprehension, when we consider that carbon monoxide has over 200 times greater affinity for hemoglobin than oxygen, and practically the same diffusibility through animal membrane. Of course, this danger would only become pressing after long exposure to such an atmosphere. It is for the foregoing reasons that I cannot too strongly urge those who may have direction of rescue parties to expose their men no longer than necesary to lethal atmospheres.

[1] "Die Physiologie der Haut," Roehig, Berlin, 1876.

[2] "Human Physiology," Landois and Sterling, London, 2d ed., p. 886.

Colliery Steam Piping Suggestions

By H. H. Lawrence

Steam pipes that are well covered and well drained save money by prevention of accidents and the reduction of waste and repairs.

The installation of a steam power plant in the coal-mining field should call for no less careful consideration and design than in other industrial fields. Unfortunately, however, it often receives but scant attention, with resulting serious loss to the operator.

Some points to be considered in designing a system of steam piping are: (1) That as soon as the steam leaves the boilers it begins to condense, and since condensation cannot be absolutely prevented the design should provide for its removal. (2) Expansion in the steam line should always be provided for. (3) Valves should be located, if possible so as to allow one portion of the steam-piping system to operate while the other may be shut down for repairs. (4) Although there is no perfect heat insulator, the loss of heat from steam pipes by radiation may be reduced to a minimum by the employment of a proper covering.

It has been found experimentally that each square foot of uncovered iron pipe surface will radiate about three British thermal units per hour for each degree Fahrenheit difference between the temperature of the atmosphere and that of the steam. The exact amount of radiation depends on the humidity of the air and somewhat on the velocity with which the steam flows in the pipes. Assuming this figure to be 3 B.t.u. per hour per square foot of radiating surface, the economic loss in any particular case may be calculated from the following formula.

$$L = \frac{3\,A\,(T - T_1)\,H\,V}{965.7 \times 2000 \times E}.$$

In which L is the loss in dollars per annum due to steam condensation. A equals area in square feet of the pipe surface exposed to the air. T equals temperature of the steam in degrees Fahrenheit. T_1 equals mean temperature of the surrounding air in degrees Fahrenheit. H equals the total number of hours steam is conveyed through pipes per annum. E

equals the evaporation of water in pounds from and at 212 deg. F. per pound of coal; V equals value of fuel per short ton including handling and disposition of ashes, etc., and 965.7 equals the latent heat of steam at 212 deg. F. If A equals 1000, T equals 315 deg., T_1 equals 60 deg., H equals 3000, E equals 10 and V equals $3. Then L equals $356.47. The 1000 sq.ft. of pipe surface is equivalent to 577 lineal ft. of 6-in. pipe or 443 ft. of 8-in. pipe.

By using a proper covering as much as 90 per cent. of this loss may be saved. There are many makes of covering on the market and the best way to secure a good article is to purchase it from a firm having an established requtation. Pipe covering is usually made in two forms; one, known as sectional, which consists of molded segments held in place by metal straps and is easily applied; the other, a plastic cement which is more particularly adapted to the insulation of pipe fittings, etc.

If a steam line is constructed so that there are sags, low points or pockets, the condensed water will gradually accumulate and reduce the sectional area of the pipe until forced out in more or less large quantities by the steam. This is especially apt to occur if the demand for steam is intermittent and it is from this source that there arises the well-known water hammer caused by the steam carrying a quantity of water along at a high velocity and delivering it against some elbow or valve with considerable impact. The effect of such a rush of water into the cylinders of a reciprocating engine is too well known to require further comment.

All low points in steam lines should, therefore, be properly drained, either by specially designed apparatus for eliminating the water or by "bleeders" as shown in Fig. 1.

Removing the Water of Condensation

The sketches, Figs. 2, 3 and 4, show methods by which the water of condensation is removed. In the several sketches B represents the boiler and E the engine. Fig. 2 shows the simplest method used in piping. The water of condensation flows into the engine with the steam, unless separators V are provided to remove it. In case all of the engines are stopped, as at night, water will accumulate in the pipe and cause trouble when starting the engines, unless the water is drained off by "bleeders." In Fig. 2 the piping to the engine is made from the top of the main, so that the water of condensation will run to the dead end; the small amount of water that is carried over to the engine may be removed by the separator V. The water thus accumulated at the end of the main should be continuously removed by a pump or trap.

In Fig. 3 the pump or trap at S is replaced by a drain pipe, which is connected below the elevation of the boiler water and will drain automatically, provided the drop in pressure in the main is not so great as to maintain a level of water in the drain higher than the point S. If the level maintained is lower than the separators V, then they may be connected to the drain pipe, and in case it is necessary to make a dip in the main, such as at L, the lowest point of this should also be connected to the drain. The entire system will then maintain its circulation; there will be no strains set up in the pipe by alternate heating and cooling, and the whole will be self-draining, whether working or not. When installing such a drainage system, all connections with the drain should be provided with check valves, such as are shown in Fig. 1.

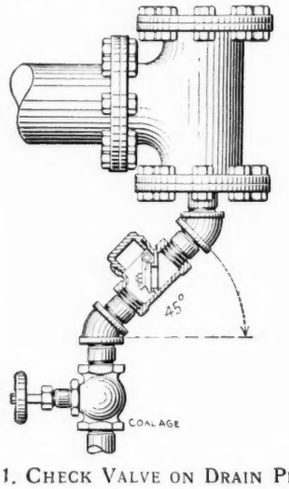


Fig. 1. Check Valve on Drain Pipe

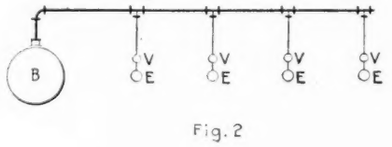


Fig. 2

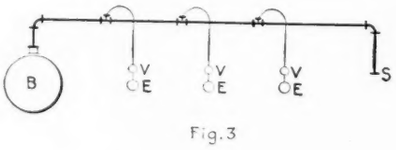


Fig. 3

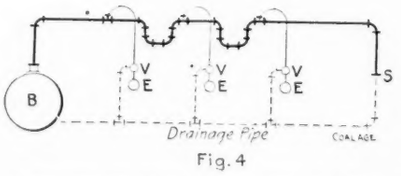


Fig. 4

Methods of Installing Steam Lines

Where the elevation of the boilers is sufficiently below that of the engines, as in some of the anthracite collieries in Pennsylvania, the gravity return system of steam piping is feasible, and the results thus obtained are entirely satisfactory in every respect. In a majority of cases, however, the required difference of elevation cannot be obtained and in such instances it is common practice to lead the condensed water back to the feed pumps, which return it to the boiler at a high temperature (about 212 deg. F.). As many drain pipes as possible should be brought together in this way.

Constructing a Branch From the Mains

In leading off a branch from the mains, the connection should always be made at the top of the main, and a horizontal partition at the center of the tee will improve the action of the branch still further, since in case of a quick demand for steam at the engine, the flowing water at the bottom of the main cannot be lifted into the outlet pipe.

It has been the experience of mechanical engineers that the pitch of all the pipe lines should be in the direction of the flow of steam. If a rise is to be placed in the main, a drain should be located at the lowest point just before the rise. In terminating the mains and all important branches, such as at S, in Fig. 4, the ends should be provided with a drop-leg or some other form of low point in the system, and these should be piped to the drainage pump.

A like connection should be made at all fittings which are of such form that the water may collect in them. A method that gives good results in draining mains is to lay a small drainage pipe about 1½ in. in diameter at a suitable distance below the mains and connect it with all the low spots in the piping, and also with the drainage pump.

In order to prevent water entering the mains, from which the steam may have been shut off, a swinging check valve should be used at each connection between the drainage pipe and the main. Such a valve should be placed at an angle of 45 deg., as shown in Fig. 1, so that the valve disk takes a position nearly vertical. In this position it requires practically no head of water to force it open when in action.

Some of the advantages to be gained by a drainage system such as outlined above are the recovery of the otherwise waste heat in the water of condensation, the elimination of strains due to cooling of the pipes when not in use, together with the consequent reduction in the number of pipe leaks, and the delivery of drier steam to the engines, which insures cylinder lubrication with a minimum amount of oil. However, whether or not such an installation will pay at a plant of the usual size in the coalfields, where fuel is cheap, is a matter which will be determined almost entirely by local conditions.

Coal at normal temperature absorbs oxygen, some coals doing so more rapidly than others. Certain unsaturated compounds in the coal combine with the oxygen without producing any great amount of carbon dioxide.

Self Contained Breathing Apparatus

Special Correspondence*

An account of an expert test of self-contained breathing apparatus, grading them according to their availability and recommending certain modifications.

*The report of a committee of the South Midland coalowners upon an investigation conducted in the mining department of the University of Birmingham into self-contained breathing apparatus for rescue and recovery work in mines after underground fires and explosions. Birmingham (England). Cornish Brothers, Ltd., publishers to the University, 37, New street. Price of report, 5s. net.

The experimental committee, appointed to investigate certain self-contained breathing apparatus with the object of recommending a suitable appliance for use in the mines of the South Midland coal fields, has issued a report of considerable interest. The members of the committee were well known mining engineers in the Midlands, and the practical investigations were of a somewhat protracted nature, the proceedings being directed by Dr. John Cadman, professor of mining at the Birmingham University, who occupied the position of chairman of committee.

The appointment of the committee was largely the outcome of the Homestead colliery disaster, when the local organization was proved to be so inadequate and the absence of suitable appliances so pronounced that an urgent appeal to the Yorkshire rescue stations for help was rendered imperative. There is abundant evidence in the report now made public that the committee conducted the experiments in the experimental mine of the university with the sole object of securing the most practical information possible relating to rescue apparatus. In the result they may not have given universal satisfaction, for that is scarcely possible where it is necessary to condemn as well as to praise; but that the members of the committee in the prosecution of their labors have sought to give the apparatus a fair trial and to arrive at an honest conclusion regarding the merits of the prospective types examined, will be generally conceded.

Those who have an opportunity to study the report in detail will do so with both pleasure and profit, for it contains some interesting and informing data. Six types of apparatus were examined, and it appears the committee endeavored to reproduce the actual conditions which occur in a mine after an underground fire, and they further undertook such forms of exertion as are then necessary. During each test and each group of tests they collected the following data: The favorable and unfavorable points observed by each wearer during each experiment, the details and nature of the work accomplished, the time the apparatus was worn, the body temperature, pulse and weight of each man before and after the test, the increased weight in the CO_2 absorbent, together with details of the conditions under which each test was conducted.

In parenthesis it may be noted that the youngest member of the committee was 26 years of age and the oldest 50; height ranged from 5 ft. 7 in. to 6 ft. 6 in., and weight from 116 to 195 pounds.

During the progress of the investigation the makers of the apparatus occasionally renewed or refitted defective or badly designed parts. The inquiry was extended considerably, because improvements were made in the apparatus from time to time—improvements which were largely the outcome of the committee's experiments. In this way the task set at the commencement became difficult and seemed almost endless.

For the purpose of the report, the apparatus were considered in two distinct groups, depending upon: (a) The attachment to the face; (b) the gas supply.

Helmets, Masks and Mouthpieces Compared

Under (a) are considered: (1) Helmets or masks covering the whole face; (2) half-masks covering the nose and mouth only; (3) mouthpieces. At the commencement of the tests the committee were all disposed to imagine that the helmet was the most comfortable attachment, but gaining more experience they ultimately came to the unanimous opinion that the helmet is entirely unsuited for use in mines. As explained, helmets as at present constructed, do not permit of a sufficient field of vision, and this renders traveling very difficult, particularly when crawling or looking in an upward direction. The half-mask permits of comfortable breathing, does not restrict the vision, but is very difficult to apply to the face, and the entire muzzling of the nose and mouth and the pressure on the face and chin become depressing and uncomfortable after some time, particularly when the wearer is perspiring.

The mouthpiece, consisting of an india-rubber tube with a flange of suitable size and shape to insert between the teeth and the lips, has much in its favor for use underground, and as far as the experience of the committee goes, is the only suitable attachment. Its favorable features are: The range of vision is not limited; it can be readily inserted in the mouth; it is comfortable and efficient; conversation is possible by slightly distending or raising the mouthpiece, which, even in the most deadly atmosphere, may be momentarily released for expectoration.

Respirable Air Supply Compared

Reverting to classification (b), depending upon gas supply, the Aerolith apparatus depends for its oxygen supply upon the evaporation of liquid air rich in oxygen. The report says: "The supply of oxygen is intermittent, and does not respond to excessive exertion and the expiratory tube occasionally becomes blocked with ice." At the same time it is stated that the apparatus, as improved by Mr. Blackett, seems to overcome this difficulty, and the experiments, so far as they went, were very satisfactory. For reasons given, however, the committee do not seem to favor "this form of apparatus as an efficient type for use in mines."

In the compressed-oxygen type, those giving constant supply (Draeger, Fleuss, Meco) have the oxygen stored in cylinders capable of carrying 260 to 290 liters at 120 atmospheres. The oxygen is supplied for breathing purposes by means of a reducing valve, which may be adjusted, but cannot then be altered while the apparatus is being worn.

In the Draeger and Meco, the reduction in pressure is utilized by means of an injector for circulating the gas continuously through the breathing bag and regenerators; in the Fleuss the oxygen reduced in pressure simply passes direct to the breathing and regenerating bag. The automatic oxygen supply apparatus is represented by the Weg, which theoretically is most efficient, and is of excellent design in many respects; but the committee say "the automatic valve has not reached a state of perfection sufficient to warrant us in recommending it as suitable."

After describing in some detail the tests and experiments, the committee say all the apparatus examined can be used to some extent in mine rescue work, although the experiments revealed defects in construction and principle which are more pronounced in some types than others. To illustrate the various conclusions arrived at they have prepared the table printed on the next page.

Three of the types of apparatus were eliminated by the committee as being the least efficient by comparison, and the Draeger, Meco and Fleuss reserved for the final test as to their suitability, the opinion expressed being that all "are capable of much improvement, and should be modified before being adopted."

Decision of Committee

The claims of the selected appliances are discussed as follows:

"For work under normal conditions,

and as the apparatus now stand, we are of opinion that the Fleuss is superior to any which we have examined, the order of preference for such work being: 1, Fleuss. 2, Draeger. 3, Meco (Westfalia).

"Under conditions where the temperature of the atmosphere is high, and under long spells of excessive exertion, the Fleuss apparatus shows defects in that the inspiring air attains a high temperature which renders the apparatus uncomfortable and defective. The absolute comfort in distribution of the weight and the flexibility of the tubes has led us to prefer this type under conditions of reasonable atmospheric temperatures and work, but the defect referred to is so serious in an apparatus of such merit that unless remedied, we cannot recommend the Fleuss as suitable under the conditions likely to obtain in rescue work in your district.

"On the other hand, in the more severe tests made in atmospheres with high temperatures, the Meco (Westfalia) and Draeger showed superiority to the Fleuss, the order of preference in these tests being: 1, Meco. 2, Draeger. 3, Fleuss.

"The bad distribution of the weight in both the Meco and the Draeger, and the stiffness of tubes connecting the mouthpiece to the apparatus, render these apparatus clumsy and uncomfortable.

"It will be seen that we favor the Fleuss type on account of its general comfort and adaptability under normal conditions of temperature, and the Meco (Westfalia) and Draeger types in excessively warm and moist atmospheres."

The report contains a specification of apparatus. Appendix I gives details of apparatus with observations. Appendix II examples of instructions for tests. Appendix III proposed scheme for organization of brigades. Appendix IV photographs of apparatus examined.

RESULTING TESTS OF BREATHING APPARATUS

Apparatus	Mechanical Construction	Body Comfort	General Adaptability for Work	Helmet	Mask	Mouthpiece	Efficiency of Oxygen Supply	Efficiency of Absorbent	Temperature of Air Supply after Period of Exertion
Aerolith	bad	v'ry good	bad	bad	....	....	irregular	....	good
Draeger	good	fair	good	bad	....	bad	v'ry good	v'ry good	good
Fleuss	v'ry good	v'ry good	v'ry good	good*	....	v'ry good	good	fair	bad
Hall-Rees	good	bad	bad	bad	....	....	bad	....	bad
Meco	good	good	fair	bad	bad	bad	v'ry good	v'ry good	good
Weg	good	good	fair	....	fair	....	irregular	v'ry good	good

*Detachable helmet.

Pillar Drawing in Contiguous Seams

By Frank Lynde

Pillar drawing, even under normal conditions, is a delicate and difficult operation, but when complicated, as here described, the problem is indeed a serious one. The correct solution will be arrived at only by experimenting and a number of methods for robbing are suggested.

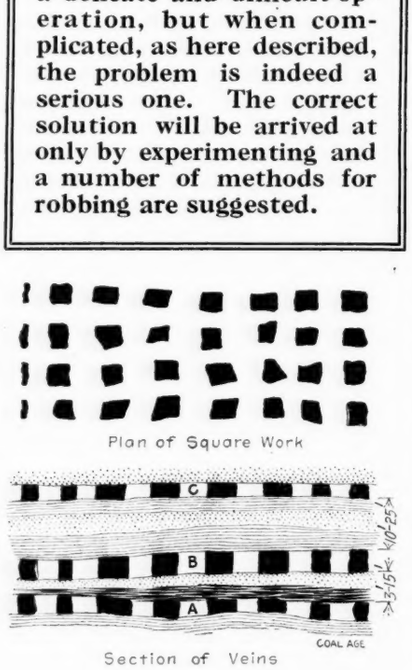
An interesting problem in pillar robbing has arisen in the anthracite field, where three closely contiguous seams are being worked. These seams have been practically worked out and the operators are now facing the problem of drawing the pillars.

The accompanying sketch shows the relative position of the seams which are designated at *A*, *B*, *C*, beginning at the bottom. In the case under consideration, these seams have from 100 to 125 ft. of hard sandstone cover and 50 to 90 ft. of wash material. *A* and *C* are about 6 ft. thick, and *B* somewhat thicker. The stratum between *A* and *B* varies from 3 to 10 ft., the material changing from bone to soft sandstone. The stratum between *B* and *C* is from 10 to 25 ft. thick and of a somewhat harder sandstone.

B seam, being the thickest, was the first one to be worked, the mining being done by the room-and-pillar system, with rooms 42 ft. centers and 24 ft. wide. The *A* seam was next worked by the same system as used in *B* seam, and the rooms so driven as to have all pillars directly under those in the *A* seam. The *C* seam was next opened and worked in the same manner as *A* and *B*, so that all pillars in the seams *A*, *B* and *C* formed practically continuous vertical columns, one directly above the other.

The particular workings under consideration are about 50 ft. higher than the shaft bottom, making it difficult to flush with culm. Also the elevation of the high-water mark in this section is about 50 ft. below the top of the hard sandstone above *C* seam.

Pillar drawing in contiguous seams having this comparatively thin and irregular parting presents many difficult problems. The case may be considered under the following heads: *A*, Culm Flushing; *B*, Sand and Dirt Flushing; *C*, Flushed with Mine Refuse, and *D*, Square System.



WORKING CONTIGUOUS SEAMS

FLUSHING

Under ordinary conditions it would seem the proper method would be to flush the workings of *A* and *B* seams with culm. Then draw the pillars in *C* seam and permit the roof to settle on *A* and *B* seams. Where the stratum between *A* and *B* seams is of considerable thickness, say 7 ft. or over, *B* seam should be robbed next. Where this parting is less than 7 ft. thick, both *A* and *B* seams may be worked together.

An objection to this method would be the necessity of putting down a drill hole or drill holes for flushing, since the bottom of the shaft is below the workings, and it would be difficult to utilize it for this purpose. Care should be taken to have the hole so located as to be readily accessible to all parts to be flushed.

B, Sand and Dirt Flushing—If there are no improvements on the surface, the wash material may be hydraulicked into *A* and *B* seams through a series of drill holes. But it must be remembered that flushing of this kind requires considerable fall in order to be an economical operation. Sand and dirt are not so readily handled by this system as culm, and if the seams pitch less than 6 deg., such heavy material cannot be readily flushed. The supporting power of sand and dirt is greater than that of culm, but the cost is more as more holes are required and more water per unit volume of flushed material, to say nothing of increased labor cost.

C, Flushed with Mine Refuse—If the culm and sand are impracticable, rock and slate may be used, which have been thrown out from the breakers.

The material will, of course, have to be broken up, to accomplish which a crusher with a speed of between 800 and 1200 r.p.m. and driven with 50- or 60-h.p. engine should be used, and in case electrical energy is available the street-car motor type of drive gives good results. Under normal conditions this crusher will handle from 40 to 50 tons of material per hour. In event of material being harder than slate, one of the low-speed crushers should be used. The amount of water required for such operations varies from 4000 to 6000 gallons per ton of material and the installation of such a plant costs from $2500 to $3500.

CRIBS

C, Cribs—Should flushing operations of any kind not be practicable, cribs may be built in *A* and *B* seams, one above the other in every second or third room, or about 100 ft. apart. Such cribs should be from 8 to 10 ft. square and well ballasted with rock. *C* seam can then be robbed, and when *A* and *B* seams take the pressure, the cribs will have a tendency to prevent the pillars from chipping.

D, Square System—If all these systems prove impracticable and in addition it should prove necessary to protect the surface, probably the only remaining method is the square system as illustrated in the accompanying sketch. In this system of mining, the pillars are all cut up into squares sufficiently strong to support the roof pressure. In some instances 50 to 60 per cent. of pillar coal can be recovered by this method. All the pillars should be left one above the other.

In any event, an undertaking of this kind should be so systematized as to divide robbing into a number of sections. One section should be worked at a time as the removal of the pillar coal is extremely difficult and the result uncertain. If a given method fails in one section, employ another method in the next section.

New River Coal Field

SPECIAL CORRESPONDENCE

The past year has been, in many respects, an abnormal one in the New River fields; hardly any new mines have been opened, and, while the output of coal has been good, prices have been uniformly low, in many cases below cost of production. For the first three months of the year prices were fairly well maintained and the operators worked together, but after Apr. 1, everything went to pieces and the coal-mining industry has been in that condition ever since, until the last two months, when the operators, realizing that they could not mine coal profitably under such conditions, began to pull together again. Such a state of affairs has militated against any new developments and the year has been a quiet one in that respect.

The principal development has been along transportation lines, involving the diversion of some 70,000 tons per month from shipment over the Chesapeake & Ohio Ry. to the Virginian. This was brought about by the construction of a line from the Loup Creek district to the Virginian by the McKell interest, the largest individual owner and producer of New River coals.

Another important change of ownership has lately taken place, the Loup Creek Collieries Co., with an acreage of 25,000 and shipments of 400,000 tons per annum, has passed into complete ownership of the H. H. Rogers estate.

Along technical lines there has been little of interest to chronicle. A new mining machine now being experimented with at one of the large mines, will, it is confidently expected, lower mining costs and put out coal in better condition.

The Eccles mines of the New River Collieries Co., which have been under development for the past three or four years, are now beginning to load heavy tonnages. They are now loading about 25 cars daily and, when fully developed, expect to have an output of 5000 tons.

Strenuous efforts have been made during the past year to develop new markets for the New River-Pocahontas coals, the operators realizing that they can no longer depend on New England to take all surplus coal and to cover the output of all future developments. These efforts have met with considerable success and it is believed that 1912 will show a much needed increase in shipments to Mediterranean ports and South America.

Additional Montana Coal Statistics

BY J. B. MCDERMOTT*

As already noted in COAL AGE, No. 13, p. 408, the total production of coal in Montana for the year ending Oct. 31, 1911, was 2,913,397 tons, having a value of $4,903,620.73. The total production for the same period in the previous year was 2,970,246 tons, having a value of $5,405,847.72.

The total number of men employed underground during 1911 was 3132, and the number employed above ground 644, making the total number of coal miners employed in the state during the year of 1911, 3776. The total production per man per day was 3.3 tons. The total amount of black powder used was 1,808,745 lb., and the total amount of dynamite used was 35,220 pounds.

There was one accident for every 76 men employed, and 58,268 tons were produced per accident. There was one life lost for every 224,107 tons produced, or one for every 290 men employed; 3.44 men were killed per thousand employed.

*State coal-mine inspector, Helena, Mont.

Azoturia

This disease, common in mules, is an affection of the liver and blood-forming functions, the prominent symptoms being loss of control of the hnid limbs and the passage of ropy and dark-colored urine. These suggest that the urinary organs are affected but this is not the case. There is an excess of azotous or nitrogenous constituents in the blood and it is from this fact that the name "azoturia" is derived. The disease does not exhibit itself when the mule is kept at pasture, but when it is living on highly nitrogenous food such as oats and is kept long in idleness. A mule thus overfed and underworked is not affected while in the stable; exercise seems to permit the working of the secreted poisons. The quicker breathing of the animal, while laboring, seems to cause a transference of the poison from the overcharged liver and the portal veins of the abdomen.

The following notice relating to azoturia is displayed in the mule and horse barns of the Consolidation Coal Company, in West Virginia.

"It is a disease of too frequent occurrence during the winter months. Stablemen, remember that there is no excuse for the occurrence of azoturia. This disease is caused by feeding working rations to idle horses. Remember that azoturia can be prevented. It takes but 48 hours for this disease to develop.

"All horses idle from any cause whatever must have their grain rations cut down until they return to work. Symptoms of azoturia are plain and should be recognized by stable attendants. The animal is brought out of the stable after having been well fed and rested. He comes out in high spirits, full of life, travels a short distance or works a short time when he becomes lazy, sweats freely, knuckles over at fetlocks and may lie or fall down, perhaps being unable to rise. The muscles of the haunch become swollen and hard. The urine becomes coffee color. Muscular spasms, uremic convulsions and death may be expected.

"Should azoturia occur in your stable, the first thing to do is to call your veterinary surgeon, stating what you believe to be the trouble so that the surgeon may bring proper remedies with him. The second thing to do is to get the horse into a box stall or on the barn floor. Bed him down with plenty of straw or hay, offer him water to drink, turn him from side to side every four hours; blanket him if possible; do not dose a case of azoturia with colic remedy, large doses of spirits of niter or anything else that you have on hand. Call the veterinary surgeon, await his arrival and in the meantime make the animal as comfortable as possible.

Coal Mine Ventilating Equipment

By W. M. Weigel*

The construction and operation of the disk fan are described and formulas derived for its pressure and capacity. The distinguishing characteristics of the Guibal centrifugal fan are also set forth. This is the third of a series of articles on mechanical ventiiators.

*Associate professor of mining, Pennsylvania State College, State College, Penn.

Disk fans have vanes or blades set obliquely to the plane of rotation, as in wind mills or screw propellers for boats. They are usually mounted on a horizontal shaft and are placed directly in the line of the current of air that they move. The difference in pressure on the two sides of the wheel is due to the change in velocity of the air.

The blades are constructed of sheet steel, the inner ends being fastened to a hub on the shaft. The outer ends may or may not be connected by wrought-iron distance pieces but in any case the back of each blade is braced near the top to an extension of the main hub, or to an extra hub. This is necessary to prevent deflection of the light blades by the air pressure. A cast-iron or sheet-steel casing encircles the wheel with just sufficient clearance to prevent touching. The width of this casing is a little greater than the axial thickness of the wheel.

Fig. 1 shows the general construction of a motor-driven ventilator of this type as made by S. B. Stine, before being placed in position. When installed, the airway or mine opening is built up close to the surrounding ring with either brickwork or tongued and grooved lumber. In the smaller sizes the motor may be direct-connected to the fan shaft. For the larger sizes instead of using a direct or geared motor drive, the fan may be driven by belting to a steam engine, motor or line shaft. This latter method has the advantage of offering less obstruction to the air current.

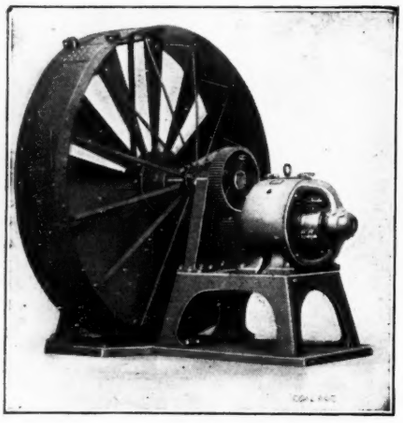


FIG. 1. STINE DISK FAN

The number of vanes in disk fans varies from 4 to 12. Increasing the number of vanes increases the frictional resistances, but strengthens the action of the fan. It is usually necessary to make the central disk or boss quite large, ¼ to ⅓ the diameter of the wheel, in order to prevent the air from rushing back through the fan at this point, where the pressure developed is the least.

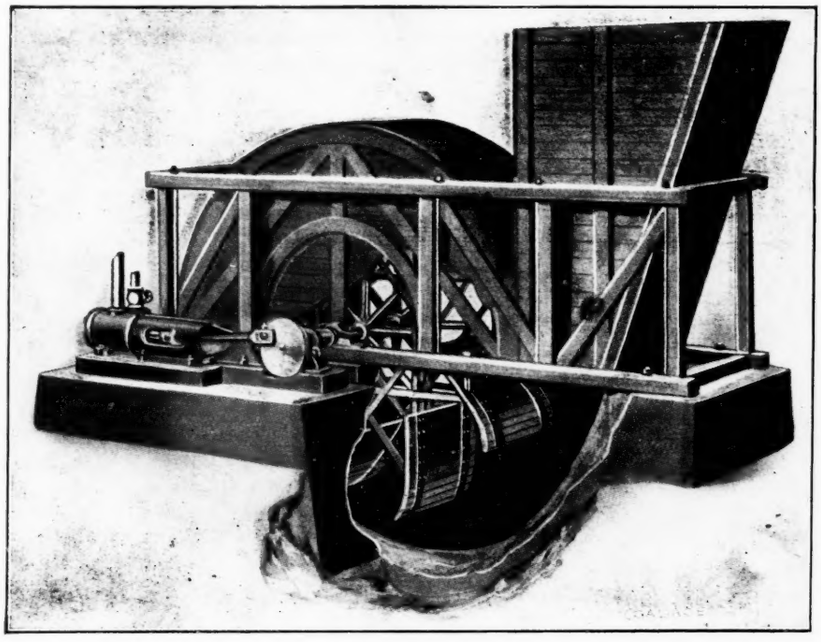


FIG. 2. GUIBAL FAN WITH WOODEN BLADES AND CASING

The advantages of this type of fan lie in its low first cost and low cost of installation, no heavy foundations being required; its adaptability to emergency use because of the ease and quickness with which it may be installed; and its fairly high efficiency when working with low pressures. It is not suited to air pressures much above 1-in. water gage or to quantities of air exceeding 80,000 to 90,000 cu.ft. per minute. These fans are made, however, in sizes up to 12 ft. in diameter with capacities of 100,000 cu.ft. of air per minute. As mentioned before they are usually set directly in the airway and are thus liable to destruction from an explosion.

PRESSURE AND CAPACITY OF DISK FANS

The blades of disk fans may be considered as sectors of a helix, and in fact they follow the lines of a helix to a certain extent, the angle which the blade makes with the plane of rotation increasing as the center is approached.

Let

α = Angle made by the blade with the plane of rotation, at any distance from the center.

r = Radius at this point.

then $2\pi r \tan. \alpha$ = the pitch of the blade, and disregarding the friction of the air on the blade, a particle of air would be moved forward a distance equal to the pitch in one revolution of the wheel, if the blade was a continuous helical surface; that is, it would be moved forward a distance $2\pi r \tan. \alpha$ normal to the plane of rotation. Letting n = number of revolutions per second and v = the velocity of the air leaving the face of the wheel in feet per second, then

$$v = 2\pi r n \tan. \alpha. \qquad (1)$$

The velocity v is equivalent to a total pressure of $\sqrt{2gh}$ where h equals the head in feet of a column of air necessary to produce the velocity v. In order to make uniform comparisons, the weight of a cubic foot of dry air at 32 deg. F., at the sea level should be taken as a basis. Under these conditions a cubic foot of air weighs 0.0807 lb. and the pressure equivalent to a velocity v is $p = 0.0807\ h$, where

p = Pressure in lb. per sq.ft.

and

$\frac{p}{5.2}$ = Pressure in in. of water, also let

i = Water-gage in inches,

then

$p = 5.2i$,

and

$$h = \frac{5.2\,i}{0.0807} = \frac{v^2}{2\,g},$$

from which

$$i = \frac{v^2}{128.86\,g}, \text{ or } v^2 = 128.86\,g\,i.$$

Theoretical and Actual Pressure and Capacity

Substituting the value of v^2 in equation (1)

$$i = \frac{(2\,\pi\,r\,n\,\tan.\,\alpha)^2}{128.86\,g}. \qquad (2)$$

This is, of course, the total theoretical pressure attainable, that is, velocity pressure + static pressure, and if the fan is operated against a resistance, all the energy expended will not be converted into velocity alone. The pressure developed will be less than (2) because of the friction of the air on the blades, and the "slip" of the fan. The actual pressure will vary with the design of the fan, and the conditions under which it operates, and will be from 60 per cent. to 75 per cent. of that found from equation (2) where i does not greatly exceed one inch.

In order that the pressure or velocity of the air may be the same over the entire face of the wheel, the value $2\pi r \tan\alpha$ must equal a constant, but this condition requires too great an angle of the blade near the center of the wheel. To overcome this difficulty the large central disk or boss previously mentioned; is employed and at the same time the ends of the blades fastened to this are not given the full pitch. The pressure actually developed is probably that due to the conditions existing at the mean of the inner and outer radii.

The pressure increases as the square of the tangent of the angle of the blades but a point is soon reached on increasing this angle, beyond which the shock of the air on entering the blades and the consequent churning and eddying has an even greater effect on reducing the pressure and decreasing the efficiency.

The theoretical capacity of the fan is the product of the velocity by the area of the annular space between the inner and outer circumferences.

Let

r_1 = Radius of the central boss or hub;

r_2 = Radius of the tips of the vanes;

Q = Capacity in cubic feet per second;

then

$$Q = \pi\,v\,(r_2^2 - r_1^2) \qquad (3)$$

Since the velocity varies with the ratio of the velocity pressure to total pressure (that is, velocity pressure + static pressure) the volume discharged will approach nearest the theoretical when both sides of the fan are open to the atmosphere, and will be zero when the fan is discharging into or exhausting from a closed space.

The angle of the blades with the axis of rotation varies from 20 deg. to 35 deg. in the different makes of fans, and to some extent depends on the work the fan is to do.

Guibal Fans

Many forms of centrifugal fans are used at American mines, almost as many forms as there are different manufacturers of fans, but each has certain characteristics by which it may be classified as belonging to one of the following groups:

a. Guibal fans.
b. Capell fans.
c. Modern steel-plate fans.
d. High-speed or multivane fans.

The Guibal fan was one of the first forms used and is distinguished by its large diameter and its comparatively few blades, which are plane surfaces or surfaces curved only slightly. Fig. 3 shows the outlines of a typical Guibal fan, 35 ft. in diameter, and 11 ft. 8 in. wide, with inlet on one side only. As seen in the illustration the blades terminate at the circumference of the inlet, and slope backward about 30 deg. from a radial position. The light double lines extending across the inlet show the arms and bracing of the blades. These are bolted to cast-iron spiders keyed to the fan shaft as illustrated in Fig. 2, which shows a Guibal fan with part of the casing removed.

Referring again to Fig. 3, it is seen that the inlet is approximately one-half the diameter of the fan wheel, and that the spiral casing follows the circumference of the fan after leaving the point of cutoff, and then gradually enlarges, the expansion or discharge area at the cutoff being small in comparison with the diameter of the fan. This is another distinctive feature of the Guibal fan.

There are no cheek plates or annular disks connecting the sides of the blades, the side casing fitting to them as closely as possible without actually touching. In Fig. 3 it is seen that the blades curve forward at their tips to a radial position, while in Fig. 2 they curve backward; there is no recognized standard in respect to this.

Formerly the blades, casing and chimney were made of wood, and many fans of this construction are still in use and giving excellent service. All-steel construction is better, however, because it is more durable, has less leakage and is fireproof, a most important consideration. These fans may have an inlet on each side, but more often are provided with a single inlet. They are built as small as 10 ft. in diameter.

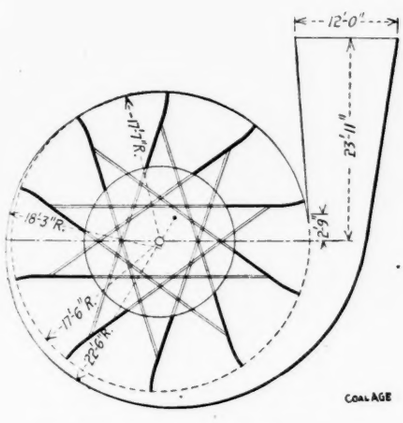


Fig. 3. Guibal Centrifugal Type

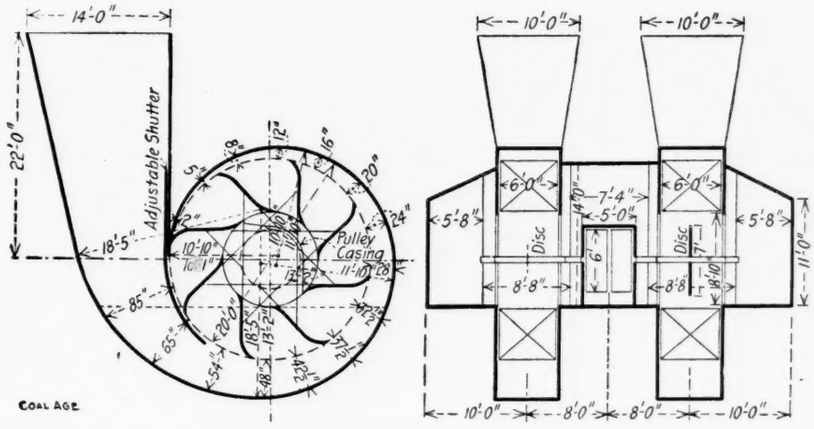


Fig. 4. Double Centrifugal Fan with Cutoff Shutter

The Cutoff Shutter

When air is being discharged into the spiral casing from between two blades, the pressure is on the front of the blade. Now as the tip of the blade passes the point of cutoff the discharge of air is suddenly stopped, causing more or less shock, and a sudden removal of the pressure from the front of the blade. This condition tends to cause vibrations injur-

ious to the fan, and pulsations in the air. To overcome it what is known as the Walker Anti-Vibrations Shutter was introduced.

This device consists of a flexible slide introduced at the point of cutoff, and supported between guides on the inside of the casing, which are curved to a circle of such size that the blade tips will just clear the shutter. By raising or lowering this sliding shutter the point of cutoff is changed and the discharge area is varied to suit the work the fan is doing. The lower edge of the shutter is notched in the form of an inverted *V*, the notch starting from each lower corner. Thus a blade on reaching the lower end of the shutter has the area of this notch through which to discharge the air in front of it, and the area gradually reducing as the blade advances, the air is discharged gradually and shock prevented.

The location of the shutter is shown in Fig. 4, illustrating the outlines of a Guibal fan in which the tips of the vanes bend backward and the inner ends forward, so that the air may enter from the inlet with less shock. This installation at the Susquehanna Coal Company's colliery, Nanticoke, Penn.,* consists of two fans, as indicated in the illustration, drawing air from one mine. They are mounted on separate shafts, but are driven by one duplex engine.

*"Centrifugal Ventilators," by R. V. Norris, *Trans.* A. I. M. E., Oct., 1891.

From the dimensions given in Figs. 3 and 4, it is seen that the spiral casing is not a true mathematical spiral, which would be difficult to lay out in practice, but consists of arcs of circles with increasing radii. The diameter of the inlet is approximately one-half of the diameter of the fan wheel, and the width of the blades for single-inlet fans one-third or less of the diameter.

Guibal fans have good efficiencies, and are suitable for large volumes of air at medium water gages, that is, 2 in. to 5 in. On account of their large diameter and slow rotative speeds they are especially adaptable to direct engine drive. They have found their largest application in the anthracite district of Pennsylvania.

United Mine Workers' Convention

Special Correspondence

The convention at Indianapolis will determine the stand that will be taken by miners with regard to making new wage contracts April 1, in bituminous and anthracite coalfields throughout the country. Daily reports of the proceedings by our own representative.

Opening Sessions on Tuesday

Fourteen hundred delegates, representing 314,000 organized coal miners, gathered in Tomlinson Hall, Indianapolis, Jan. 16, for one of the most important conventions and conferences in the history of the coal industry of the United States and Canada, the 23rd annual convention of the United Mine Workers of America. One of the chief purposes of the convention will be to formulate the demands that will be made by the miners when their representatives meet the mine operators to negotiate and establish new wage contracts for both the bituminous and anthracite fields.

President John P. White called the convention to order and the opening session was given up to addresses of welcome by representatives of civic and labor associations. Former Mayor Charles A. Bookwalter spoke for the Central Labor Union of Indianapolis. He said the miners were confronted by a question of great importance to the common good and their action would have a large influence in the industrial world. Other speeches of welcome were made by Rabbi M. M. Feuerlicht, representing Mayor Shank and Gov. Marshall. President White expressed the appreciation of the entire membership for the cordial welcome extended by the City of Indianapolis.

At the afternoon session the committee on rules and organization made a report providing that sessions should be held from 9 to 12 a.m. and from 1:20 to 5 p.m. Speeches were limited to five minutes and a rule made that no member be allowed to speak more than once on any question until all who wished to be heard had spoken; disorderly conduct to be punished with a reprimand and expulsion from the hall. Cushing's manual was adopted as a parliamentary guide.

President White read his annual report and Vice-President Hayes and Secretary-Treasurer Perry followed with their reports. President White said, among other things, that the miners will most certainly not consider any reduction in their present wage scales, but will strive for such advances in pay as seem possible to achieve; adding: "Probably no convention of the United Mine Workers in recent years has assumed a greater obligation than will this one if it fully discharges its duties to those who compose our membership."

Mr. White also said that now, practically on the eve of the expiration of the wage contracts, the attention of the whole Union membership and of the entire country will be centered on the deliberations of this convention and, "It will remain for the convention to outline a policy that will best meet the needs of the people and adopt a plan that will redound to the benefit of our membership everywhere. Our scale committee will do well to consider the responsibilities that devolve upon it."

The president then described the condition of the organization at the time when he took charge and spoke of conditions now, pointing out the growth and improvements made during the past year. The causes of the numerous strikes were discussed and while refusing to surrender the right to strike, he advocated a more reasonable course. His report showed that the United Mine Workers have a paid-up membership of 266,256, which is an increase of 24,864 over the previous year.

In conclusion, President White recommended that the organization renew its affiliation with the World's Mining Congress, which connection was discontinued in 1909.

Socialism Introduced

After going on record as favoring government ownership of industries, the socialists among the delegates introduced a resolution indorsing their party as "the political party of the working class," but the motion met with resistance and was defeated. Stormy debate occupied the whole of two sessions of the convention. Action was deferred on a resolution providing that the United Mine Workers should withdraw from the American Federation of Labor, condemning the National Civic Federation as an agent of capitalists and sharply criticizing the officials and leaders of the Federation of Labor for coöperation with the Civic Federation.

Because the organization had stipulated that it would be nonpolitical, the resolutions committee reported that it had refused to concur in the resolution committing the organization to the Socialist party, and offered as a substitute one declaring that "it would be well if workers would unite in the political as well as the industrial field." This brought about another discussion that lasted the remainder of the day.

John Walker, president of the Illinois miners, speaking for the socialists, intimated that if necessary an effort would be made to amend the constitution so that the national union could indorse the Socialist party. In a fiery speech he declared: "If you will not listen to our pleadings you will pay the cost." The "capitalistro parties," he said, possess the

power to enforce injunction, and to kill if necessary, and he urged the working class to seek political power "so that if it is necessary to use the injunction and the bayonet they will be used in defense of your firesides."

President Mooney, of the Missouri organization, protesting against the campaign of the socialists in the convention, declared the delegates could not pledge the Mine Workers of America to any political party. He said the constitution provides that religious or political subjects shall not enter into the deliberations of the convention.

Consolidation Possible

Consolidation of the Western Federation of Miners and the United Mine Workers is a strong possibility and was prophesied by John A. McKinnon, of British Columbia, and Edwin Young, of Montana, who addressed the convention. Both speakers represented the Western Miners as fraternal delegates to the convention. "All that is necessary," they declared, "is to refer the matter to the Westerners and surrender the charter of the American Federation of Labor, thus clearing the way for consolidation." The proposed amalgamation would result in the most powerful individual labor union in the world, with half a million members or more. The delegates cheered the prophecy.

In the report of Vice-president Hayes it was shown that while the United Mine Workers have a membership of 300,000 there are about 450,000 coal miners that are unorganized; hence, it is a serious question whether they should hold out for a general national agreement, when in some districts smaller bodies of operators are willing to come to terms. The scale committee, appointed Jan. 18, went into session Friday and is expected to report on or before Jan. 25.

Factional Dispute

The report of the credentials committee afforded an opportunity for airing the factional troubles which have nearly disrupted the organization of District No. 5, western Pennsylvania, during the past four or five years. Fiery oratory was fanned to a white heat when the committee reported that the Gibbons delegates were not entitled to seats in the convention on the ground that the three men selected were not members of the organization, and recommended the seating of the Feehan delegates. Robert Gibbons, Abe Kephart and James Sabin, the three deposed delegates, fought every inch of the way until the vote was reported in favor of seating their opponents.

Unusual interest was shown in these debates, because the Feehan-Gibbons fight is said to have been the most serious factional controversy that has arisen on the convention floor in many years. Conservative labor leaders expressed regret at the evident display of unharmonious spirit in the labor movement, and predicted defeat of the organization's plans if factional fights continue.

Interstate Wage Conference

Although the Feehan-Gibbons debate occupied approximately all Saturday's session, President White reported that his plans for the revival of the old interstate joint wage-scale movement have proved successful. He said the operators have promised to attend the meeting of the joint wage-scale committee to be held here Thursday, Jan. 25. He also said that miners of the anthracite field have demanded an eight-hour working day, a one-year contract, and a 20-per cent. increase in wages. His announcement that the interstate joint movement will be revived brought forth much applause as many of the delegates have feared that the operators would refuse to enter into a joint conference.

The miners indorsed a resolution to the effect that the organization should strive to have enacted compensation laws in the various states where mining is conducted. A proposition to start an international sick and accident fund was voted down, and several resolutions in regard to membership in the National Civic Federation of Labor were carried over until Monday. It cannot be said that a great deal was accomplished by the convention during the first week.

Scale Committee Appointed

The delegates to the miners' convention took up the matter of amending their constitution, Monday morning. Just before noon adjournment, President White appointed a joint wage-scale committee to go into conference with the operators, Thursday, Jan. 25. If the work of the convention is completed before a report is made by the members of the scale committee, the delegates will remain until a report is secured so as to ratify or reject the work of the conference.

The convention is greatly elated over the fact that the operators agreed to come to Indianapolis for a joint conference. The miners' prospects are declared to be brighter than they have been for years. There is an abiding hope that a joint wage scale will be speedily agreed upon.

Constitutional Amendment

An effort was made, Tuesday, by the socialist element, to frame the new constitution so as to shear the international officials of much of their power and place it with the rank and file to be expressed by the referendum vote. In some instances the effort was successful, but in the more important matters the authority was left with the international president and other officials.

After the next annual elections international officers will be chosen every two years instead of annually. A report of the constitution committee to this effect was embodied in the new constitution after a long debate in which an effort was made to keep the clause out of the constitution until it had received the endorsement of the membership through a referendum vote.

Almost the entire day was devoted to the constitution committee's report. It is thought that at least two days more will be required to pass or reject the proposed constitution.

The Year 1911 in Indiana

Special Correspondence

With five important strikes affecting some 2850 miners, in addition to numerous minor difficulties between the operators and the men, the year of 1911 in Indiana was one of the hardest in a long period for both miners and operators.

There are 18,000 miners in Indiana qualified to mine coal. Beginning with last May, the largest strike period in the year occurred when seven mines, the properties of three separate companies, were idle, 1500 men being ordered on strike. These were the Little Mining Co., of Green County, the Jackson Hill Co.'s mines, near Clinton, and the Coal Bluff Coal Co.'s mines, at West Terre Haute. This was a long fight and many joint meetings were held, but failed to bring a settlement, and the final decision of President Taylor, of the Illinois Operators, and President White, of the United Mine Workers, left the real issue involved in the strike unsettled. There were at the close of the year 550 men on strike in the Bicknel field in southwestern Indiana.

A far greater loss to the miners resulted from the shutdown, due to a lack of demand for steam coal. In many of the mines of the state for six months or longer, the average work was but two or three days per week, while only a small proportion of the mines worked with anything approaching regularity until the last few weeks of the year.

Taking as a basis that 9000 of the 18,000 miners of the state were out of employment through this cause, and we have as a conservative estimate that 2,700,000 days' work was lost by the Indiana miners during 1911. This is based on the estimate at the time of the worst condition that 50% of the miners were out of employment from all causes. Conditions the last few weeks of the year were much improved, although there were a number of mines running on slack time.

Two mine conventions were held during the year at Terre Haute, the first special convention in the history of the state being convened in May. The government rescue car made three visits to Terre Haute during the year and was

busy throughout the districts. First-aid teams were organized in the Terre Haute field.

The output of coal for the first half of the year was estimated at not more than 25% of the capacity of the 18,000 miners in the state. A part of the congested conditions in the Indiana coal fields is due to the presence of 2500 miners who came from other fields in 1910, during the prolonged Illinois strike, and remained in the state during 1911. The total production of coal in Indiana for 1910 was 18,389,815 tons, with a spot value of $20,813,659. The figures for 1911 are not available, but it is estimated that the total production will fall short of the 1910 output by several million tons.

World's Consumption of Bunker Coal

The suggestion that the opening of the Panama Canal may render feasible the establishment of a great American station for supplying coal from the mines of the United States to vessels of the world lends interest to an estimate prepared by the Bureau of Statistics, Department of Commerce and Labor, of the coal consumption on the oceans of the world. The statement estimates the coal consumed on the oceans of the world at approximately 75 milion tons per annum, valued at over 250 million dollars.

An exact statement of the quantity of coal consumed by the merchant marine and navies of the world cannot be made, owing to the fact that comparatively few countries state in separate terms the quantity of coal supplied to vessels for their own use, or for "bunkering" purposes.

The United States statistics show about 9 million long tons supplied to vessels at ocean ports to be placed in their bunkers for their own use, and the British reports show about 20 million long tons supplied to vessels in the foreign trade and 2½ million tons to vessels in the coastwise trade. This would make for the two great coal-producing countries of the world—the United States and the United Kindom—a total of over 30 million tons supplied directly to vessels for "bunkering" purposes.

In addition to this, however, a considerable percentage of the coal sent out of Great Britain as "exports" passes to ports and stations in various parts of the world from which it is finally supplied to ocean vessels for fuel purposes. A paper presented before the Royal Statistical Society of England by D. A. Thomas, M. P., stated that:

> The great bulk of our export of coal is for the use of steamships, and it is within the mark to say that over half of our exports are for navigation purposes. . . . Cardiff alone ships over a million tons annually to Port Said, over a half million to Malta and Gibralter, about the same quantity to Cape Verde and the Canaries, over 300,000 to Colombo, and large quantities to Aden, practically the whole of which goes to bunker steam vessels calling to coal at those depots.

As the British exports of coal, aside from that recorded as supplied to vessels for fueling purposes, amounted in 1910 to over 62 million long tons, the above quoted estimate would seem to justify adding to the 30 million tons recorded as bunker coal by the United Kingdom and the United States another 30 million as the share of British exports which finally becomes bunker coal.

While the Bureau of Statistics is unable to state the share of American coal exports which become vessel supplies (aside from that actually reported as bunker coal and not included in the export statement) it is quite probable that a considerable percentage of the coal from the United States which passes to the West Indian Islands and the coast of Mexico is used for vessel fueling. Add to this the more than 2 million tons supplied by the Japanese mines to vessels engaged in the foreign trade, the more than 1 million tons supplied from Australia, the nearly 1 million tons supplied from India, plus the estimated consumption of about 3 million tons by the navies of the world, and the Bureau of Statistics estimate of an average of 75 million tons consumed on the oceans of the world seems a conservative one. As the valuation of the coal exported for steaming purposes averages about $3.50 per ton, the further estimate of the value of the coal used on the oceans of the world—over 250 million dollars per annum—seems also a conservative one.

The Wyoming Mine Explosion

Reported by Telegraph

On Jan. 20, at 4:10 p.m., a small local explosion occurred at the No. 4 mine of the Kemmerer Coal Co., located at Susie, Wyo. Over 100 men were in the mine at the time of the explosion, of whom five were killed and 18 slightly injured.

Location and Geology

The town of Susie is located about eight miles north of Kemmerer, Wyo., on a branch of the Oregon Short Line R.R., in the extreme southwestern part of the state. It is about 270 miles, by rail, north of Salt Lake City, and 440 south of Butte, Montana.

According to the U. S. Geological Survey map "Coalfields of the United States," this field is described as the Hams Fork Region of the Rocky Mountain Province. The coal occurs in the Fork Benton division of the Colorado formation, belonging to the Upper Cretaceous series. The measures have a strong westerly dip varying from 15 to 35 deg.

The coal is a high-grade bituminous and ranks as one of the best fuels in the West. It is described by the U. S. Geological Survey as "an excellent fuel for all purposes, quite hard, breaks with a bright fracture and stands storage and long transportation with but little loss."

Mining Methods

There are three principal operating companies in this field; the Union Pacific Coal Co., a subsidiary of the Union Pacific R.R. Co., operating in the southern part; the Diamond Coal & Coke Co., a subsidiary of the Amalgamated Copper Co., operating in the central part; and the Kemmerer Coal Co. (at one of whose mines the explosion occurred) operating in the northern part.

Mining is done entirely by means of slopes sunk approximately on the dip and having water-level entries turned every 350 to 450 ft. From these entries rooms are driven to the rise generally on 60-ft. centers, with 35-ft. rooms and 25-ft. pillars, with barrier pillars at intervals of from 2 to 6 rooms, depending on the roof conditions. Horses are used for haulage on these entries and the ordinary engine-plane system is used on the slopes. Small quantities of firedamp are occasionally found which burns in a peculiarly sluggish manner when ignited. The coal is shot off the solid almost without exception.

The Explosion

This district has been particularly free from any extensive explosions, having been the scene of only one other serious disaster, that at Diamondville, Dec. 1, 1905, which cost the lives of 18 men. The quantities of gas encountered were not considered excessive, and the mines are, without exception, under competent management and carefully handled.

The No. 4 mine of the Kemmerer Coal Co., the scene of the present disaster, is a comparatively new one, having been under development only some two or three years. The mine was opened on the usual slope system and worked by the room-and-pillar method. It is well equipped with modern appliances throughout.

The explosion is supposed to have been the result of a blown-out shot in the second north entry, and occurred just as the day shift were going off. An unusual feature of the disaster is the fact that the fatalities appear to have been confined entirely to Americans.

The mine rescue car No. 4 was on the scene of the accident within an hour, and together with assistance from the neighboring mines, rendered valuable aid in the rescue work. The mine was only slightly injured by the explosion, and all the bodies have been recovered.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

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COAL AGE

Labor Unrest

Time, with no leaden heel, seems hastening the approach of a general stagnation of the coal business consequent on a strike in which the two largest coal-producing nations, and one that ranks sixth in the list, may well be involved. The United States, Great Britain and Belgium produce together 65 per cent. of the production of the world.

The miners of Great Britain, on Jan. 10, by an overwhelming vote of 445,801 to 115,921, decided to cease work on March 1. They hope to get the mine owners to consent to a minimum wage, but this the operators are not likely to concede without a bitter struggle. They do not feel able to make any large concessions, because the national competitor, Germany, has for years been displacing English coal, the output of that country having risen 200 per cent. while England's production has only advanced 68 per cent.

The profits have recently been reduced by the operation of the eight hours' act, and the English operators feel that they cannot bear any further burdens. In view of the fact that the production of the English mine worker is less than half as much as is produced in our anthracite regions per inside man employed, and almost exactly one-third of the average output per man inside in the bituminous regions of this country, it might be suggested that speeding up would be a possible solution of the miners' difficulties and not a minimum wage.

The later reports appear to indicate a feeling of anxiety on the part of the miners, as if they had somewhat exhausted their spleen by the vote cast, and are beginning already to look with apprehension toward the titanic struggle. Moreover, questions of patriotism also intervene. A naval war depends on steam, and, furthermore, taxation could not well meet the demands of a war if business were at the same time stagnated by internal strife. This complication always results in the mine owners and mine workers being alike compelled by public opinion to suppress their variances on behalf of the preservation of the empire. Realizing the gravity of the situation, the British government has sought to place contracts in America, without much avail, owing to the difficulties in our own labor situation.

The Belgian strike has not yet involved the whole kingdom, and all differences may be adjusted before April 1, when our own strike is anticipated. There is also a strong feeling of unrest in Germany, though it is not so manifest as in Great Britain and Belgium.

Home troubles may yet end in peace. The miners in those states where higher wages are paid and the unions are strong, will think twice before they decide to strike and thus aid the operators of those districts where the men will not strike and where lower wages prevail. It is not likely that the miners of West Virginia will lay down their tools when those of Pennsylvania, Ohio, Indiana and Illinois come out on strike. Hence, the end of a long struggle would inevitably show West Virginia more strongly entrenched than ever in the Northern trade. That state could well increase her output 50 per cent., and it is a safe prediction that those concerns which can forecast their coal demands will prefer to place their contracts in West Virginia, because there alone, is to be found a certainty of a steady fulfilment of contracts placed.

At times it seemed to be a safe prediction that the miners in the unionized fields would have either to accept a reduced wage at home or migrate to West Virginia and receive a reduced wage there. Nevertheless wages have risen steadily in the union fields, the operators have struggled along, in many cases increasing their indebtedness year by year. Whether the miner has gained by the increased wage is, of course, a question. He has undoubtedly suffered by working less steadily than he would, had his wage been less. But such a statement is hard to prove, and the miners so far have not realized it, finding that the days worked at mines where the unions are

strong are not materially less in number than in mines of the unorganized fields.

The action of the miners in raising wages in the northern coal fields, while leaving the state of West Virginia to its own devices, has brought the West Virginia coal field rapidly to the front as a producer. This artificial stimulus of a section of the whole industry of the nation has caused the section so stimulated to overrun all markets, with the result that in face of glut and fierce competition the northern operators are kept from raising their rates of pay. Had the unions been less prodigal of their power, their potency to increase wages would have been more marked today.

Old Hednesford Disaster

The disaster in the Old Hednesford mine of the Cannock Chase Co., Ltd., of England, Dec. 14, 1910, shows how much carelessness even today is to be found around some coal workings. The Cannock Chase Co. kept a house in the Bass seam, where the boys were in the habit of going to fill their lamps. Each boy filled his own. The bucket, that caught the waste from the filling tank, caught fire and the blaze rapidly spread. The boys had been in the habit of throwing oil-soaked wicks on the ground, when they removed them from their lamps, and consequently the condition of the floor of the heading was favorable to the spread of the conflagration. Some thirty cars stood on the track, and the man who attempted to extinguish the blaze could not move them. Consequently, when the fire spread beneath them it could not be stamped out. In a short while the cars themselves caught fire.

The separation doors between the shafts were opened by order of J. Collier, the foreman of the Bass seam, in order that the smoke and carbon dioxide would not pass through the workings, but later, at least 45 min. after the fire started, the under-manager came down, and ordered these doors shut. At the inquest he stated that he did not realize that this action would force the products of combustion into the mine and on the escaping men. Five men were asphyxiated. The jury returned a verdict recommending that a man be placed in charge of the lamp house, and that sand be stored for use in subduing such a blaze should it again occur.

It does seem that the financial interests of the coal company, even if there were no more potent reasons, should favor a more complete remedy, to wit, the removal of the lamp house altogether. But there is a valuable suggestion here, that where oil is apt to be spilled by leaking cars or other causes, a small body of sand and a shovel should be kept ready for smothering any incipient blaze. Furthermore, it would be well to strew sand over all oil droppings, later removing the oil-soaked sand at frequent intervals.

Natural Schistification

The recent explosions at Adrian and Briceville call forcibly to one's attention the fact that the latent powers of coal-dust are rarely exhibited to the full in these catastrophes owing to conditions not favoring perfect combustion. When one regards the violence at Bruceton, Monongah and Harwick, one realizes that those explosions were of an entirely different order from those which have recently occurred.

In order to make plain the severity of one of these, that at the Bruceton experimental station, it might perhaps be well to preface further remarks by stating that, to all appearance, the voids above the concrete which lined the galleries at that mine were not large enough to explain such a lift in the concrete arching as undoubtedly took place. The buckling of the reinforcement has automatically registered the fact that in one place the arch was raised twelve inches. How could this be, unless the whole overlying earth were likewise raised, and this is the explanation now finding favor.

It must be conceded that the conditions at the Bruceton mine were highly favorable for a spectacular exhibit of the explosive power of coal dust. It is true the headings were short and the force of the explosion was thus somewhat reduced, but had more dust per lineal foot been present the disruptive energies within the mine could not have been greater, though an increase of violence would have been shown, had all the headings been charged.

In the main return gallery the charge, if spread over the floor, would have covered it with a layer only 0.021 in. thick, or if the sides had aided the floor to hold the same charge, they would have been covered with an equal coating of 0.008 in. of dust. The equivalent floor charge in the oblique gallery where the dust was only distributed in half-pounds per running foot, would be 0.013 in. deep while the floor and rib charge would be less than 0.005 in. thick.

These are apparently extremely light charges. An off-hand judgment would not view them as constituting a large amount of dust. But every ounce was of such fineness and was placed in such manner as to be immediately available.

Moreover, the fuel was in such quantity that the oxygen present was insufficient to permit the carbon and hydrogen of the coal to burn completely to carbon dioxide and water. Much fuel remained unburned when the blast belched from the mouth of the mine.

Other exploded mines have had as much dust of like nature and fineness, as Bruceton; to have had more would not have increased the violence. Probably this dust was not so ingeniously distributed. But, in any event, the dust was there and its failure to do more damage must be ascribed to some form of natural schistification or dampening.

Where motors are used, the heading soon contains a large amount of sand which has been ground to fine caliber and deposited near the rails.

For example, at one mine in central Pennsylvania, with a rolling, uneven floor, no less than three gondola cars of sand are ground to powder beneath the wheels of the electric motors every month. And it was noticeable that the deep dust in the Adrian mine consisted largely of such sand dust and natural sand. In other mines with a shale roof, the constant dropping of top-rock serves, especially when it tends to slake, to schistify the floor of the mines. This found exemplification in a marked degree at Vivian, W. Va.

Schistification may be a cure for explosions, but with the leaky cars at present in general use, it would seem to be only an insufficient palliative.

There seems every probability, in the view of the British chief inspector of mines, that had electric hand lamps been in use at the Whitehaven and Hulton collieries, in England, the terrible disasters which took place there in 1910, would not have occurred. In the case of both accidents, there is little doubt but that the igniting cause of the explosion was the gauze safety lamp.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions of Indiana Examinations Held at Terre Haute, January 12, 13, 1912

MINE-BOSS EXAMINATION

Ques.—Does coal dust, when suspended in air, give to the air explosive properites?

Ans.—The finely divided dust of many bituminous coals is highly inflammable. When this dust is floating in air and exposed to a flame of sufficient volume and intensity, there are present all the conditions necessary to burn the dust with explosive rapidity. The finer and more inflammable the dust, the more rapid the combustion and the more violent the explosion, other conditions being the same. This condition is spoken of as an explosive condition of the mine air.

Ques.—(a) When is shaft timbering required and when is it not required? (b) What are buntons and what is their use?

Ans.—(a) Shaft timbering is generally required at the surface in all shaft sinking while passing through the drift overlying the harder strata. Timbering is also required, as the sinking proceeds, wherever the strata are not self-supporting under the conditions existing in the shaft. In other cases, only such curbing and buntons are required as are necessary to make the shaft safe and to support the guides, column pipes, signal wires, electric cables and other shaft equipment.

(b) Buntons are the heavy cross-timbers put in a shaft to support any part of the shaft or its equipment, or to support a temporary scaffold or staging.

Ques.—There being 43,560 sq.ft. in an acre and 27 cu.ft. to a ton, how many tons of coal may be gotten from a tract of five acres, the coal seam being 6 ft. thick and allowing 20 per cent. for loss?

Ans.—The cubic contents of this five-acre tract and 6-ft. seam is $5 \times 43{,}560 \times 6 = 1{,}306{,}800$ cu.ft. Then, taking the average weight of Indiana coal as 1 ton per cu.yd. (27 cu.ft.), and allowing for a loss of 20 per cent. or ⅕ of the contents of the seam, the net weight of coal taken out of the mine would be

$$\frac{4}{5}\left(\frac{1{,}306{,}800}{27}\right) = 38{,}720 \textit{ tons}$$

Ques.—What are the conditions that should determine the widths of rooms and headings and the size of pillars, in mine workings?

Ans.—The width of a heading is determined (1) by the requirements and use of the heading, size of mine cars and kind of haulage employed, or quantity of air to be circulated in airway; (2) by the nature of the roof and floor, the roof pressure, and the length of time the entry must be kept open. The width of rooms is determined by the depth, thickness and inclination of the seam; the character of the roof, floor and coal; the system of mining adopted and length of time the rooms must be kept open. The size of entry and room pillars, alike, is determined by the data last mentioned and the width of the openings they protect.

Ques.—(a) An airway 16.7 ft. wide, 8.9 ft. high, is passing 65,000 cu.ft. of air per min.; what is the velocity of the air current?

(b) If powder smoke requires 2 min. and 17 sec. to travel 149 yd. in an airway 10x12 ft., what quantity of air is passing in the airway?

(c) In an airway 6x7 ft. the anemometer registers 75 ft. per min.; what quantity of air is passing in the airway? Show each step in the calculation of these three questions.

Ans.—(a) The sectional area of the airway is $16.7 \times 8.9 = 148.63$ sq.ft. The average velocity of the air current in this airway is then

$$v = \frac{q}{a} = \frac{65{,}000}{148.63} = 437.3 \textit{ ft. per min.}$$

(b) The powder smoke is observed to travel $149 \times 3 = 447$ ft. in $(2 \times 60) + 17 = 137$ sec., or $\frac{447}{137} \times 60 = 195.75$ ft. per min. The average velocity of the air current, however, is less than the observed velocity of the smoke, and may be assumed, with fairly close approximation, to be 0.8 of this velocity. Or, in this case, the average velocity of the air is $195.75 \times 0.8 = 156.6$ ft. per min., the area of the airway $10 \times 12 = 120$ sq.ft., and the quantity of air passing is then

$$q = av = 120 \times 156.6$$
$$= \text{say } 18{,}800 \textit{ cu.ft. per min.}$$

(c) The sectional area of this airway is $6 \times 7 = 42$ sq.ft. Assuming that the reading of the instrument represents more or less accurately the average velocity of the air current,, the quantity of air passing in this airway is

$$q = av = 42 \times 75$$
$$= 3150 \textit{ cu.ft. per min.}$$

FIREBOSS EXAMINATION

Ques.—If an explosion should occur in a safety lamp in use, what should be done?

Ans.—Assuming that the explosion within the lamp chimney or combustion chamber was light and did not force the flame through the gauze, the lamp should be lowered slowly and carefully withdrawn from the gas. This is a most critical moment and requires the utmost self-possession on the part of the one holding the lamp.

Explosion of gas in a safety lamp usually occurs as a series of small explosions following each other in quick succession. Often little balloons of flame appear and explode with a light pop. The phenomenon indicates a danerous approach to a highly explosive atmosphere. It may be that a more violent explosion in the lamp is only prevented by the extinctive gases (burnt air) confined in the top of the lamp and more or less permeating the air in the combustion chamber. In withdrawing a lamp from a body of sharp gas, the fresh air entering the lamp will often produce a highly explosive mixture within and greatly increase the danger. Under these conditions extreme caution is required to avoid trouble.

Ques.—What are the causes of sudden outbursts of gas in coal mines; and what, in your opinion, should be done to prevent accidents resulting from the same?

Ans.—Sudden outbursts of gas are the result of the gradual weakening of the strata in which the gases are confined under pressure, owing to the extraction of the coal. The roof action in mines, following the extraction of large areas of coal, often results in the formation of vacuous spaces or voids in the strata, and these become filled with gas under great pressure. The gas works forward toward the openings as the strata are disturbed, often producing ominous noises, "bumps" and "poundings." In many cases these noises are followed, after a time, by the bursting out of immense volumes of gas into the mine workings; and frequently the openings are choked with hundreds of tons of coal and slate thrown down by the force of the escaping gas.

In mines where such occurrences are common, every effort should be made to drain the gas from the strata in advance of the workings, by boreholes sunk from the surface or driven in advance of headings; or by driving narrow headings a

distance into the virgin coal and allowing time for the gas to drain off sufficiently to relieve the pressure. All openings should be driven up narrow with wide pillars between them, the principal work depending on drawing back the pillars. The face and ribs of all new work should be well protected by timbering.

Ques.—Are you in favor of mixed lights in mines where explosive gas is generated? Give reasons in full.

Ans.—Mixed lights should never be used. If safeties are required to be used at all in a mine or any portion of a mine, no open lights should be allowed at the same time, in such mine or section. The practice of permitting the use of torches or open lights on entries or gangways, while safety lamps only are to be used at the face, is dangerous; because, at any moment, an accumulation of gas in the waste, or in an idle room, or void place where it has escaped notice may be forced out onto the entry by a fall of roof, or a heavy shot, or by some derangement of the circulation and be ignited by the open lamps.

Ques.—Should a fireboss be under the supervision of the mine boss or superintendent, or should he have complete control over that part of the work that pertains to firebossing?

Ans.—The Indiana mine law, Section 22, makes it "unlawful for any person to serve in the capacity of mine boss, fireboss or hoisting engineer, at any mine, without having . . . . . a certificate of service or competency." It is the evident meaning and intention of the law to place the work of firebossing, in the mine, in charge of a man whose competency to perform that service has been ascertained by a satisfactory examination and is certified by a duly authorized certificate. It would not be logical or in keeping with the spirit of the law to limit the authority of the fireboss in respect to the particular work placed in his charge. In the eyes of the law he is the *competent* person to look after and control whatever pertains to firebossing.

Ques.—Do you approve of the practice of brushing gas from a place with a coat or canvas? State why.

Ans.—The custom of brushing gas is unsafe as a practice, because it can never be known with certainty how much gas may be distributed and thrown into the air. The person brushing out the gas may become enveloped in a dangerous atmosphere, from which he would find it difficult to escape. We may, of course, assume that he has taken the precaution to place his safety lamp where he believes it will cause no trouble, or to extinguish the open light if he has one. Any accumulation of gas in a mine should be handled with caution, and its removal effected by means of temporary brattices, so arranged as to cause the air current to sweep away the gas.

Mine Haulage Question

Mine-haulage Systems Compared

Ques.—Give a brief description of the different systems of haulage used in coal mines; and state the particular advantage or disadvantage of each system.

Ans.—Mine haulage may be divided into two general classes; namely, animal or mule haulage and mechanical haulage, which is again divided into rope and motor haulage. There are three kinds of rope haulage; namely, inclined-plane haulage (which includes both gravity-plane and engine-plane haulage), tail-rope haulage and endless-rope haulage. Motor haulage includes steam, compressed-air and electric motor haulage.

Mule haulage is simple and needs no description. It is best adapted to small mines, not sufficiently developed to install a mechanical system of haulage; and to gathering hauls in larger mines, where the coal is gathered from the different working places and brought by mules to a central station, where trips are made up to be hauled by mechanical means to the shaft or slope bottom.

In gravity-plane haulage, the loaded cars descending the incline by gravity pull the empty cars up the plane by means of a rope that passes over a head-sheave at the top of the plane. The two ends of the rope are attached to the two trips, respectively. Gravity haulage has the advantage that no motive power is required to move the cars.

In engine-plane haulage, a winding engine, located at the top or at the bottom of the plane, hauls the loads up the incline and lowers the empties, by means of a rope attached, in turn, to each trip. Engine-plane haulage is adapted to the haulage of loaded cars up grades that are too steep for mule or motor haulage.

In tail-rope haulage, the loaded cars are hauled in trips, from an inside parting to the shaft or slope bottom, by means of a rope that extends from the winding drum of an engine on the surface, into the mine, and is attached to the front end of the trip. This is the main rope. The tail rope is twice the length of the main rope, and extends from the winding drum of the same haulage engine to the inby end of the parting, where it passes over a tail-sheave and is attached to the rear end of the trip. The tail rope hauls the empty cars into the mine, the cars pulling in the main rope after them. This system is adapted to haulage from several districts and short variable grades that make an endless-rope system impracticable.

The endless-rope system consists of one endless rope running from the double drum or sheaves of the winding engine to the large sheave at the inby end of the parting in the mine and back again to the engine. The rope both here and in the tail-rope system is supported on rollers and small sheaves the entire length of the entry. In this system the cars are attached to the rope at regular intervals by means of a grip or a special automatic clip, the loads being hauled out on one side of the rope and the empties pulled in on the other side continuously. The endless-rope system is well adapted to a long haul on easy grades, a large output and steady producton of coal with little delay.

Motor haulage requires little explanation. Motor cars specially designed for mine work are used instead of mules. Their use is limited to light grades, this limit of gradient being determined practically by the slipping of the motor wheels on the iron rails. In motor-haulage practice, grades exceeding 2.5 per cent. are avoided wherever possible, except for short distances only. It is possible for a motor alone to climb a grade of 8 or even 10 per cent. by sanding the rails; but whenever the grade exceeds, say, 2 or 2.5 per cent., there is too large a proportion of the power of the motor absorbed in its own propulsion, and too little power is effective for hauling the trip.

On level roads a mine motor will generally give a draw-bar pull equal to about ⅛ of its own weight. Under general conditions in mines, the weight of the loaded trip a motor will pull on a level road is 40 or 50 times the draw-bar pull; or, say 8 or 10 times the weight of the motor car. Grades and curves in the track very much reduce the weight of loaded trip a given motor will haul. The draw-bar pull is reduced 1% for each per cent. of grade, and the live load or weight of loaded trip hauled decreases much more rapidly, being about 50% only, on a 2 per cent. grade.

The speed of hauling in mine-motor practice is commonly estimated, in miles per hour, as about ⅛ of the diameter of the drive-wheels, in inches, for the full hauling capacity of the motor. For example, a six-ton motor car, with 30-in. drive wheels, may be estimated as capable of hauling, say, 24 loaded mine cars weighing two tons each, at a speed of about 6 miles per hour, under ordinary conditions in mines, on a level road.

Steam locomotives are but little used in mines, because of the gases given off by the furnace in generating the steam. Compressed-air motors have the advantage of greatly assisting the ventilation of the entries by the exhaust air of the engines. This system of haulage requires the installation of a pipe line for conducting the compressed air into the mine, and charging stations and reheaters for heating the air, on long haulages. The pipes are easily broken by roof falls, and the system is not as flexible as electric haulage.

Electric haulage, while introducing the dangers of electricity in the mine, has the advantage of giving a flexible system of haulage capable of reaching all parts of the workings.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

[This department of COAL AGE *next week will be devoted entirely to a statement of the views of readers on the subject of sealing off mine fires. A number of letters dealing with the problem, and inspired by our foreword last week, have already been received. We earnestly request every reader who has not yet expressed an opinion to send us a brief statement of his ideas in the matter. —*ED.*]*

Gas Locomotives for Mines

The following are some of the results obtained with the "Otto" Internal Combustion mine locomotive, which was referred to in issue No. 7, page 217, of COAL AGE, as working at the Barton mines in Nottingham, England.

The length of line inside the mine is about 700 yd. and on the surface about 1½ miles. With the previous horse traction one round trip on the surface line occupied over two hours, including shunting at the wharf, hauling a train of 10 loaded wagons of about 20 tons total gross load. The locomotive makes one trip with the same number of wagons in ¾ of an hour regularly, and in some cases in 35 min. The line is for the greater part level but partly in favor of the loads. The heaviest grades are 0.77% against loads and 4% against empties.

The petrol consumption during 27 workings days was 38 gal. which equals 1.4 gal. per day from 7 a.m., to 5 p.m. During this time 1274 net tons of stone were hauled. This shows that with one gallon of petrol, 33½ net tons were covered; at a tare of 10 cwt. per wagon this represents a total gross load of 47.6 tons, this being over a line of 1½ miles, so that 71.4 ton-miles were covered with one gallon of petrol. The locomotive is fitted with two speed-gears in either direction, i.e., for 3¾ and 7½ miles per hour.

This locomotive has replaced six horses which cost $14.40 per week in fodder alone, while also requiring four boys. The locomotive only requires one driver and one boy for shutting the gates, when crossing the roads. The petrol consumption per week of about 8½ gal. at 16c. exclusive of rebate, amounts to about $1.34 per week.

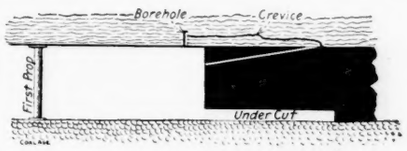
Thus the great economy of petrol locomotives over horse-haulage is shown by these figures. The driving is extremely simple, one of the miners being appointed to do this. The starting of the locomotive is a matter of minutes, so that during long intervals the engine can be stopped to save petrol.

ENGLISH ENGINEER.

Liverpool, England.

Preservation of Draw-Slate

It has occurred to me that as the draw-slate is often loosened by the gases resulting from coal shots, it might be well to drill a few small holes along the face as near the coal as possible, so that the gas might have an opportunity to escape before the center of the open space between the first post and the coal face is reached.



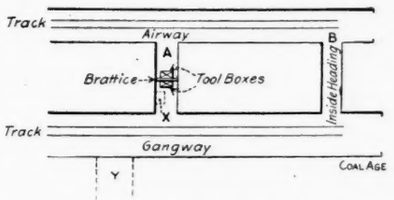
A SUGGESTION FOR PREVENTING ROOF FALLS

At that point the gases would have considerable bending moment, whereas, if drawn off at the holes suggested, they would have no opportunity to spring the roof. I understand that in some places this scheme is adopted to prevent the fire-damp in the slate from breaking it down.

Chicago, Ill. D. ORSON.

Powder in Mines

The accompanying sketch illustrates the working faces of a pair of entries where two miners are at work. *A* and *B* are two crosscuts. *B* is open for ventilation, while *A* is closed with a brattice; two tool boxes are located on both sides of the brattice. Does the law allow each miner to have a keg of powder in the mine? Article XII, rule 26, of the mining laws, relating to the quantity of powder that each miner is allowed to have, says: "Gunpowder or any other explosive shall not be stored in a mine, and a workman shall not have at any one time in any one place more than one keg or box containing 25 lb., unless more is necessary for a person to accomplish one day's work."



LOCATION OF TOOL BOXES

According to the law each miner is allowed to store 25 lb. of explosive, and if two miners are permitted to arrange their storing boxes as shown on the sketch, then there would be two kegs or boxes of explosives in one place, while, according to law, there should be only one box or keg in any one place. Each miner should be allowed to store only a half of a keg, or 12½ lb. each.

Now, supposing that a new room is to be started along the gangway, as at *Y*, shown by the dotted lines, there is a possibility of adding another tool box to the crosscut *A*, which already contains two; the new location is to be at *X*. Since each miner is permitted to store 25 lb. of powder, the maximum quantity of 75 lb. of explosive may be stored in one crosscut. In the same way the number of tool boxes can be increased until there are many more in the croscut. Does the law intend to allow each miner to have 25 lb. of explosive stored irrespective of the proximity of other miners' store boxes, or is one crosscut to be occupied by only one miner? At any rate the law is ambiguous, for, judged by common-sense rules, there should be only one tool box in any one crosscut.

Pittston, Penn.

To Avoid Gas Explosions in Mines

I have had 38 years' practical experience in coal mining, doing every kind of work in and about the mines, and I have been watching closely for some time past the mater of gas explosions. It seems to me that with proper care and due regard to the removal of gas, such explosions can be prevented. I have never yet seen the mine that was properly equipped for taking care of the gas the mine produces. If explosions are to be prevented, the mine must be prepared to take care of the gas that is generated just as it is prepared to take care of the coal mined. I will say in regard to the system of ventilation, whether the air is split or not, this alone will not overcome the gas and prevent dangerous accumulations at the working face.

New Philadelphia, Ohio. J. F. H.

[Our correspondent might have suggested just what measures and precautions he considers are essential in the operation of a coal mine, in order that explosions of gas may be avoided.—EDITOR.]

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Co-operation in Coal Mining Communities

By Charles L. Fay*

In the average large coal-mining community, there are three factors which operate as determining forces in its economic problems.

First. That part of society composed of citizens related to business and professional enterprises outside the coal company interests.

Second. The miners.

Third. The coal company (which is personified in the men holding positions from superintendent to president.)

The selfish attitude of each factor and the consequent lack of vital coöperation prevents the development of a society unit and results in antagonisms. These ill-advised and self-constituted groups make pretensions occasionally, of recognizing a common community interest, but continue, however, to be unduly critical and make of every circumstance a bone of contention about which to quarrel. In all this, a pettiness is oftentimes manifested that is ridiculous, particularly when the largeness of each of the three factors is considered.

The Officious Public

To illustrate my point: the business community decides to promote a welfare movement. It is pointed out that the movement will not only benefit the business community, but the employees of the coal company as well. To qualify the position, it is stated that the movement will benefit the employees by providing a medium and means of self-help that will aid in personal advancement and contribute to their social well-being; also that as the employees are "lifted" in moral standard and vocational efficiency, the company will secure more competent and thrifty workmen, which is of business value to the company.

Consequently factor No. 1 argues with enthusiasm that factor No. 2 should contribute each year the equivalent of at least a day's wages as a nominal share of the necessary support, and that factor No. 3, being the great industrial and financial enterprise of the community and the largest single reaper of benefits, should be the largest single benefactor; but as the movement was originated by factor No. 1 and as factor No. 1 is well fitted to direct its activities, etc., why, of course, while each factor must be represented in the management, factor No. 1 will (with due show of patronage) control the work in hand. The basis of the virtuous proposition presented by factor No. 1, is selfishness, which expresses itself through a generous impulse made negative by a spirit of patronage and condescension.

The Captain of Industry

Reverse the order. Factor No. 3 conceives, from some source of inspiration, an idea that if put in force in the community should operate upon the employees in a manner to benefit the company by tending to regulate the habits of the workmen, and present an opportunity for self help that naturally would lead to more efficient service. Factor No. 3, cognizant of the prejudices of factors Nos. 1 and 2 attempts to so initiate the movement as to throw responsibility upon factor No. 2, but retain the dominating power in the hands of factor No. 3. If factor No. 1 is brought into the matter at all, it is in a nominal way for which factor No. 1 must pay the price, both in substantial support and good will, selfishness being the motive, veneered by virtuous utterance, with the inevitable result that the social unbalance is further developed.

The Suspicious Working Man

Factor No. 2 in the community life is between the "Devil and the deep sea"—needing the constructive and unselfish coöperation of both factors 1 and 3 and yet segregated by both—finally becomes stubborn, suspicious and somewhat hopeless. Factor No. 2 accepts selfishness as the basis of its own struggle for self-preservation and considers coöperation outside its own class as mockery and a sop.

Now, at the dividing lines between the three social factors, and on each side of the lines, are those who possess the neighborly instinct, have some consciousness of brotherhood, a more or less unselfish conception of their own needs and the needs of others. They are glad to help and be helped. It is this advanced group that makes possible some semblance, at least, of a society balance and prevents absolute anarchy.

The Triangle of Forces

The personality of a mining community, such as indicated, must necessarily be negative. What possibilities for genuine, unselfish coöperation in such communities! How ludicrous and wasteful the selfish pull-hauling methods that exist. Yet of the existence of such a discordance, the community may be sublimely unconscious. The loss through lack of sane coöperation is manifested not only in the matter of the social unbalance of the mining communities, but between employer and employees in the much advertised "fight" between capital and labor.

For labor to organize to better the lives and living conditions of working men and to aid each other in becoming more efficient workmen and more capable and intelligent citizens is commendable. Such organization is productive of good and is respected; but to organize primarily to "fight" presumes the objective to be war not peace—destruction not construction—segregation not coöperation. Such organization produces a Napoleonic army in which the leaders are, too often, autocratic officers dominated by biased conviction or overwhelming ambition for leadership and preferment. They sacrifice the rank and file of the workmen to an organization servitude in order to hold intact their autocratic society of professional office holders. The leader with larger vision and nobler purpose is whipped into line or thrown in the "gob."

Finding Only What Is Sought

On the other hand, for capital to organize—well, that is illegal! Nevertheless, for capital to attempt to correlate its forces so as to conserve the best interests of the community the employees and capital, is both desirable and laudable, but when capital employs its superior sagacity in a careful effort to entrench itself for a constant and increasing warfare of absorption and control, setting up the principle of "subdue" or "fight," it then is presuming strife and antagonism and not coöperation.

There are radicals on both sides who cannot comprehend, will not comprehend or for personal venom or advantages do not care to comprehend the loss sustained by society and industry as a direct result of ignoring fair and reasonable coöperation. Just as the citizens not related to the companies and outside the ranks of the employees are a factor in the local community, so is the general public a factor when in a larger sense capital and labor are under con-

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sideration; and while the general public or "third party" suffers from the results of lack of coöperation between capital and labor the "public" is too often, "counted out" as far as rights are concerned.

THE PUBLIC'S EVER-READY REPROACHES

Then again, in times of open strife the public, too often, becomes obsessed by a sentimental bias to one side or the other and feeds the fires of prejudice, further hindering the spirit of coöperation even though by this means the contending forces may be brought, for the time being, to rest on their arms.

Now, there are many on both sides of the ever present capital and labor problem who are doing all in their power to better conditions, to develop the spirit of coöperation and to recognize in due measure the rights of persons and the rights of property. The efforts of such leaders are the sunlight flashes of the dawn of a better day. The sun of coöperation is appearing. Selfishness will be displaced by the spirit of unselfishness. There will be "a new heaven and a new earth."

The battle, however, continues. The basis still is selfishness and the presumption is war. Only as the possibilities in coöperation penetrate the consciousness of the rank and file, will destructive leadership be supplanted, and the day of a better peace actually dawn. What an age of privilege in which to live!

Every thinking man of courage, common sense and character may have a part in developing that consciousness in the minds of the "rank and file" that will make for better conditions and better society. But the road leads not along the way tabbed "political socialism."

First Aid at Frick Plants

BY M. J. SHIELDS*

As the field representative of the first-aid department of the American Red Cross, I undertook the organization and training of first aid corps for the H. C. Frick Coke Co., on Sept. 25, 1911, on which date a meeting was held with all the superintendents present and General Manager Clingerman presiding, at which conference the different coke plants and mines were grouped in five divisions, namely; Baggaley, Mount Pleasant, Connellsville, Uniontown and Brownsville. The superintendents were instructed to select one man out of about every fifty employees to take the training. The selection was made from mine foremen, fire- rib- and coke-bosses, electricians, motormen, hoisting engineers, miners and some outside employees. The company had a number of trained helmet and rescue men, and also quite a number of employees who had received first aid training, and they were afterwards added. So the number of men who actually attended the meetings comprised one in every thirty employees, or a total of nearly eight hundred men. A course of seven lectures was given weekly, with an intermission of two weeks, thus extending over a period of two months. The meetings were held in halls, centrally located, and all during the day time and on idle days, except in the Baggaley division. All the men instructed were supplied with the American Red Cross abridged first-aid textbook, the foreigners receiving Polish, Slavish and Italian editions, and the course of instruction pursued is the one found on page 164 in that book, namely: (1) Structure and mechanism of the body and the materials for first aid; (2) general directions for rendering first aid, study of fractures, dislocations, strains, bruises and shocks; (3) wounds, burns, scalds, and electric burns; (4) unconscious conditions, the handling and carrying of the injured; (5) special and mine injuries; (6) sanitary matters and the prevention of diseases; (7) a general review in the form of first aid contests. These lectures lasted about half an hour and then the men were given triangles, roller bandages, splints, and other first aid materials, and a practice drill took place which lasted from an hour to an hour and a half. This drill was superintended by the Company physicians and myself, and the finished work examined and criticised, and the meetings closed by free discussion of the subjects gone over in the lecture. The lecture, drill and discussion together made the total time devoted to each meeting two hours. The course ended on Nov. 25, by a series of contests in each division and the following are the names of the winners in the team obtaining first place, and the percentages scored by all the teams.

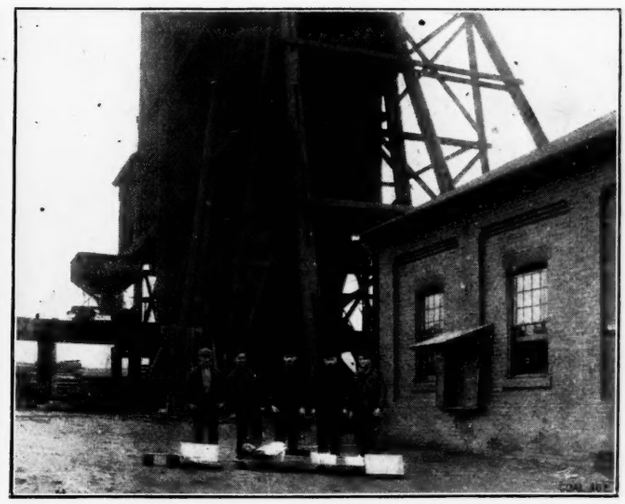
Brownsville Division.—Edenborn mine 100%—James Curry (captain), Cyrus Flesher, John Mullen (subject), Thomas Daugherty, Austin Kane, Thomas Laughran. Leckrone mine 99.%. Lambert mine 99.5%.

Uniontown Division. — Continental No. 2 mine 100%—John Tupper (captain), George Haines (subject), Wm. Cosgrove, Gideon Pike, Huston Doyle, John Bloom. Phillips mine 99.2%. Yorkrun mine 97.5%.

Mt. Pleasant Division. — Marguerite mine 100%.—A. S. Snyder (captain), Michael Kavanshansky (subject), Thos. McDermott, A. M. Weaver, Steve Susa, Harry Hudson. Standard mine 98.3%. United mine 98%.

Connellsville Division.—Davidson mine

DAVIDSON MINE SQUAD



FIRST-AID AND HELMET MEN

*First Lieutenant, Medical Relief Corps, U. S. Army, Scranton, Penn.

99.1%—Max Reidman (captain), Frank Bell, John J. Malloy, Joseph Morgan, James Yocum, George Rushnock (subject). Leisenring No. 3 mine 98.3%. Everson car shops 97.5%.

Baggaley Division—Baggaley mine 94%. John McKenna (captain), Frank Bolton, George Hoke, R. H. Barry, Harry Blystone (subject), Christ Hoke. Whitney mine 93%. Dorothy mine 91%.

The first aid department of the American Red Cross Society gave bronze medals as first prizes and certificates of merit for the second and third prizes. As contests are the next best proof to real accidents of first aid efficiency, these competitions showed some remarkable results. They proved that the men had taken a deep interest in the work and demonstrated a capacity to deal with any and all kinds of accidents in an intelligent way and I might add that contests are not only educational, but school the first aid man to be cool and calm in a real accident and remember what he knows. These contests were judged by two physicians and one practical mining man.

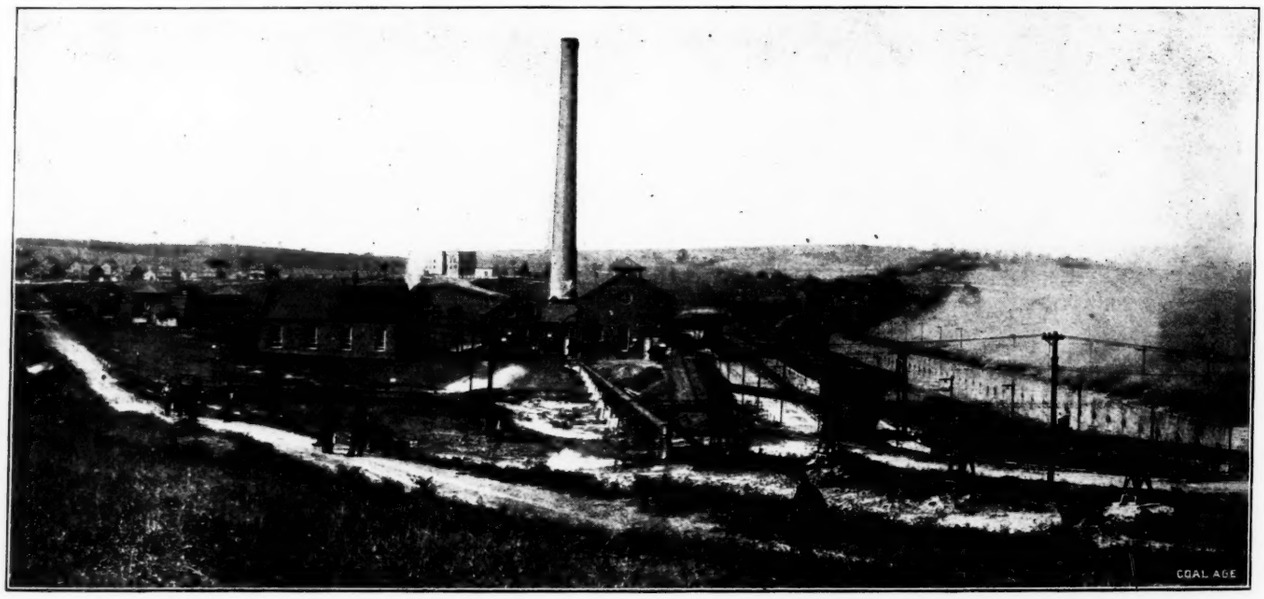
A table of specific discounts was prepared by the judges and read out prior to the beginning of the contest. It was as follows:

DISCOUNT FOR FIRST AID CONTESTS

	%
For loose or granny knot	5
For a loose bandage	5
For a loose splint	5
For faulty artificial respiration	5
For not stopping bleeding	10
For not taking care of shock	10
For not doing the most important thing first	5
For slowness in work	5
For captain's failure to command men properly	5
For awkward handling of patient or stretcher	5
For failure to be aseptic	5
For failure to entirely cover the wound	5
For lack of neatness	5

Safety the First Consideration

Each team consisted of six men, captain, subject and four assistants, and the squads were started out with a credit of one hundred per cent. and discounted from the above table. There were fifty-four teams entered and the halls where the contests were held were crowded with spectators. In this work I received the hearty co-operation of Mr. Clingerman, the general manager, and the other officials, specially C. L. Albright, secretary of the Beneficial Association. The organization and training of this splendid body of first aid men rounds out the motto and policy that President Thomas J. Lynch has adopted and carried out: "Safety the first consideration," a motto which he has striven to embody, not alone in first aid, but also in manifold schemes for accident prevention.



DAVIDSON MINE OF THE H. C. FRICK COKE COMPANY

First Aid Hints

All large mines should be equipped with four rescue corps, two inside and two outside. Each crew should consist of no less than six men, trained, not only in the use of apparatus, but also to implicit obedience to the commands of their leader. Such crews should receive instructions and training once a week.

When working in unbreathable gas see that all members of a rescue party keep close together and that every precaution is taken for their safety. Establish a relief station and a relief crew at the end of the breathable air. Patrol all doors and brattices leading to this station as a protection to the waiting relief crew. When working in thick smoke see that each rescue party retains the end of a rope that is stretched to fresh air.

When an accident has occurred remove the patient to a quiet place, taking him to the hospital room at once if his condition permits. Never carry a seriously injured patient to the engine room, as the jar of the engines is often the cause of intense agony to his shattered nerves and bones. The noise of the moving machinery also causes acute mental distress to a suffering man. Handle the patient calmly, gently, and without the appearance of nervous haste. If the head is injured it should be elevated above the body, otherwise keep the whole body on a level unless the patient is faint, in which case raise the feet or lower the head. Injured legs or arms may be benefited by being raised slightly from the level of the body. A gentle pulling of the leg of the patient not only aids, but gives him a marked sense of relief. The leg muscles tend to contract and draw a broken limb further out of line. This is corrected by gentle traction.

The most comfortable position is usually on the back with the limbs stretched out. Loosen all tight bands, cut all clothing covering the wound, but remove only just enough to allow of a thorough inspection and dressing of the wound. Dress the wound as quickly as possible to prevent infection. Do not permit your hands to come in contact with the wound unless they are aseptic. All severe bleeding should be stopped before the final dressing takes place. If the patient is unconscious, watch him with the utmost attention; if he shows signs of vomiting, place him upon his side, with the head lowered, so that the vomit may not pass into the lungs. In case of burns the wetting of the clothing with a solution of luke-warm water and baking soda will tend to relieve the pain. After the wound is dressed, let the patient rest quietly a short time before he is removed.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Coal and the Money Trust

An interesting feature in connection with the demand for a money trust inquiry is found in the fact that Mr. Lindbergh, of Minnesota, who is demanding the investigation, is apparently disposed to charge that what he terms the "money trust" is operating in connection with the coal industry. Mr. Lindbergh has submitted to the Committee on Rules, which is considering this matter, together with other data, the following statement:

"These subsidiary railway corporations, outside of the value of the express companies as stock-holding concerns, are small affairs. Their total capitalization is not over $259,000,000, with a market value of under $350,000,000. The anthracite-coal monopoly created by Morgan and Baker through the railroads is of more consequence.

"About $160,000,000 worth of anthracite coal is produced annually in the United States. All this comes from a small area of Pennsylvania. The railroads have been for 40 years buying control of these anthracite-coal lands. The first important work of Morgan as a maker of monopoly was the eliminating of competition by buying control of a competing railroad line for the New York Central. The second was an attempt to create an anthracite-coal monopoly through railroad combination. He worked at this for 20 years, and George F. Baker nearly as long, and 10 years ago the monopoly was formed. The roads that hold it are now all in the control of the seven men. These roads now own lands containing about 95 per cent. of the anthracite coal in the United States. They produce only 82 per cent. It is their policy to let the independent operators work out their deposits. This will give them in the future a still greater control of this mineral.

"It has been difficult to create any monopoly of the bituminous coal of the country; it covers so great an area. But this, like anthracite, is naturally controlled by the railroads which take it to the consumer; and there are many effective local monopolies. Morgan has been active in creating these in connection with Eastern roads. West of the Mississippi a great share of the usable coal is controlled either by the Union Pacific, the Gould system, or the Hill Lines."

This is one of the grounds upon which Mr. Lindbergh demands that investigation shall be undertaken by the committee; it being a fundamental feature of his ideas that there exists an improper relation of some kind between the banks, which, he alleges, control the money of the country, and the persons who are engaged in the production of various staple articles of which coal is one. It has not yet been decided whether to undertake the investigation or not, but the chances still favor the probability that the investigation will be begun on this or some other basis.

Progress in Pittsburg-Lake Freight-Rate Case

The Interstate Commerce Commission has resumed work on the so called Boileau case which involves the question of the relative rates between the Pittsburg district and the lake ports on the one hand and the West Virginia mines and the lake ports on the other. The discussion has now largely degenerated into a battle between accountants who are endeavoring to show what proportion of the revenues of the various roads are actually derived from coal and what proportion of the outlay is caused by the transportation of coal, this for the purpose of determining a "reasonable rate."

The Works, Coal-Mines Bill

A bill to provide for the inspection and regulation of coal mines has been introduced by Senator Works, of California. This authorizes the Secretary of the Interior to make and enforce such rules and regulations as may be necessary for the control of coal mines operating in the territories or producing coal in any state for transportation to any other state, thus taking up the old idea that the Federal government may supervise the conditions under which commodities entering into interstate trade are produced.

Section 3 of the bill provides for cooperation with state mining bureaus or commissions, and Section 4 authorizes the Secretary to go into any mine that he may wish for the purpose of ascertaining what changes of management are needed. The section continues as follows:

"That when the said Secretary shall make any order respecting the management or operation of any mine or the use or disuse of any device, apparatus, or appliance in the operation thereof, the owner or lessee of such mine shall comply with such order within a time to be fixed by said Secretary. If such owner or lessee of any such mine, or any officer or agent of such owner or lessee, shall fail or refuse to comply with any such order he shall be guilty of a misdemeanor and be fined not less than one hundred dollars nor more than five thousand dollars, to which may be added imprisonment for not exceeding six months, and each day that he shall so fail or refuse shall be a separate offense, and the said Secretary may, in his discretion, require that such mine be closed and not operated until such order is complied with, and may enforce such requirement by proper legal proceeding if not complied with."

Alabama

Birmingham—Fire, Jan. 7, at the Carbon Hill mines of the Galloway Coal & Coke Co., in Walker County, destroyed the engine house and damaged a large amount of machinery. It was with difficulty prevented from spreading to other buildings on the property. The loss is estimated at $50,000.

The Tennessee Coal, Iron & R.R. Co. has started work on the construction of 150 miner's houses at its No. 12 mines, Ensley, Ala. A new town is also being built at Edgewater near the No. 13 mines.

Colorado

Fort Lupton—Following the arrest of five union miners at the Alpha coal mines, Jan. 7, charged with riot and unlawful assemblage, all troubles ceased at the mine, and a small force of non-union miners began work the next day.

Trinidad—The Wootton Land & Fuel Co., controlled by J. P. Morgan, B. F. Cheney and a syndicate of Boston capitalists, is now operating two mines on the historic Wootton estate. The new tipple has just been completed and more than $100,000 has recently been spent in development work. Colonel J. A. Owenby, formerly of Boulder, is in charge of the properties.

Illinois

Harrisburg—The O'Gara Coal Co., which at present has a group of 17 coal mines in this vicinity, is preparing to sink two new shafts east of Harrisburg, where the company has held options for some time on the coal under 3000 acres of land. The coal is practically the same as found in other sections of this and surrounding counties.

Springfield—The Tuxhorn Coal Co. has resumed work at its mine which

has been closed down since Oct. 1, owing to a lack of orders. The mine has opened with the full force of 175 men and the prospects are good for a large business.

Canton—Owing to the falling of doors that govern the passage of air from the fan at the mine of the National Coal Co., near Middle Grove, between 15 and 20 miners were affected by lack of air, one morning recently, and operations were suspended for the remainder of the day. A similar accident took place at the No. 2 Blackhawk mine, Farmington, where 40 men were taken out from the workings before being seriously affected.

Streator—The local mine of the Harrison Coal Co. was closed down recently for a time on account of water which had seeped in from the abandoned workings at No. 4 shaft about a mile distant.

Chicago—At a meeting of representatives of the coal operators of Illinois, Indiana, Michigan, Wyoming, Montana, Iowa, Kansas, Missouri and Oklahoma, an organization known as the American Federation of Coal Operators was effected, Jan. 16, for the purpose of bringing about a peaceful solution of labor disputes. H. N. Taylor was chosen president, C. S. Keith vice-president, and Charles L. Scroggs secretary and treasurer.

During the recent cold weather the coal supply in Chicago became seriously depleted, on account of the difficulty in moving freight and operating the mines. Severe coal famines were also reported from many points in central Illinois.

Belleville—The Illinois mine-rescue car, after being stationed at Collinsville for several weeks, came here, Jan. 14, for a five or six weeks' stay.

Indiana

Indianapolis—Practically every loaded car of coal has been sent forward from the Indiana mines and empty cars sent in. Probably every mine in the state was in operation Monday, Jan. 22, for the first time in two years. Thanks are due to the good work of the railroad commission, the members of which went into the coal-distributing yards and ordered the companies to move the coal. If the mild weather continues there will be a rush to store coal by large consumers in preparation for a suspension or strike after Apr. 1. The belief persists that there will be trouble between the miners and operators.

Clinton—The Oak Hill Coal & Mining Co. has been sold to J. K. Dering, and the property transferred. Five mines in the Clinton field and about 3600 acres of coal lands are included in the deal which is said to involve $1,000,000, although the sum was not made public. The local management will not be changed except for Edward Shirkie's retirement, and the mines will continue active.

Sullivan—The last of the $100,000 which was the price paid by the Jackson Hill Coal Mining & Transport Co. for 2000 acres of coal land in Haddon township near Paxton, was paid over recently, thus closing what up to that time was the biggest coal deal ever put through in Sullivan County. Since the deal was closed last July, a large number of surveys have been made in the vicinity of Paxton, and it is said steps will be taken in the near future to sink mines.

John P. White, of Oskaloosa, Iowa, was reëlected president of the United Mine Workers by a majority of 45,424 over his oponent, Thomas L. Lewis, of Bridgeport, Ohio, according to the report of the tellers made to the convention, Jan. 18.

The wage-scale committee of the United Mine Workers of America organized Jan. 18 with J. H. Walker, of the Illinois district, as chairman. The scale committee will demand an increase in the mining rate for both bituminous and anthracite fields. Some of the members say they favor an increase of 10c. a ton, while others have indicated a preference for a 5c. advance, with a run-of-mine basis.

Iowa

Des Moines—Serious coal shortage was recently reported from practically all parts of the state; in some places it amounted to a famine. The local Commercial Club was inclined to blame the Rock Island R.R. Co. for much of the suffering in Des Moines.

Kentucky

Central City—Five men were killed as a result of an explosion in a mine of the Central City Coal & Iron Co. about 5 o'clock in the morning of Jan. 17. Four bodies have been removed. The cause is unknown. The mine is not badly damaged. Two hundred men usually are at work in the mine, but the explosion came soon after the day shift had come out and before the night men had gone down.

Louisville—The mine owners of Kentucky, carrying out a plan which had been under consideration for some time, have organized the Mine Owners' Association of Kentucky, the announced object being to promote the interests of the mining industry. The association was formed at a meeting held at Louisville. Officers were chosen and authorized to take immediate steps toward affiliating the body with the American Mining Congress.

Whitesburg—The new city of Jenkins in the Elkhorn coal field has been incorporated.

The Louisville & Eastern is to be extended from Torrent to Jackson, by way of Devil's Creek. In order to hasten this extension, owners of property along the proposed route are offering every encouragement possible in the way of reasonable charges for rights of way.

Middlesboro—The Gibson-Carr company, of Middlesboro, will be ready to ship coal by the first of February from its new mine, opened on Tye Fork of Brush Creek, Knox County. The Sneed & Meguire Coal Co., of Louisville, recently leased 10,000 acres on Colver Creek, and the Louisville & Nashville is building a branch from the terminus of the Black Mountain & Wasioto road, 20 miles north of Harlan, to the Sneed & Meguire property.

Minnesota

Albert Lea—Specimens of lignite coal, found in a trench in Mansfield, have been received here. The coal seems to be a good quality of lignite, and, as it was found close to the surface, it is presumed larger quantities can be found more deeply embedded. Some gas and indications of oil also are said to exist in the locality of the coal find. It is not probable any active investigations will be made until spring.

Missouri

Windsor—Two men were entombed and 300 had a narrow escape in the afternoon of Jan. 13, when an explosion wrecked the mine of the Bowen Coal Co., near Windsor. The day shift, comprising 300 miners, had been out of the workings only 30 min. when the explosion occurred. The cages were thrown off the guides and jammed in the shaft by the force of the blast. Rescue parties were immediately organized and through another shaft entered the west part of the mine, but no trace of the shotfirers was found. Efforts to enter the east part failed because of the smoke and heat. There is no gas in the mine, and it is believed dust caused the explosion. As soon as the explosion occurred, the fans were reversed, and an effort made to draw the gases from the mine, but this failed, because the brattices that direct the air currents were shattered by the explosion. The mine has been considered one of the safest and best equipped in the state.

Ohio

Ashtabula—This city is experiencing a coal famine. Dealers are entirely sold out, but shipments of coal are expected daily.

Gallipolis—One hundred and fifty coal barges are held up at the mouth of the Great Kanawha River in a dangerous freeze-up. Rivermen fear considerable damage when the ice breaks up.

Steubenville—A heavy ice gorge at Cables Eddy, on the Ohio River, three miles above this place, broke Jan. 18, and carried away a towboat, 18 empty coal

barges and a wharfboat. Three of the barges were sunk.

Youngstown—A number of the merchant furnaces, which have large ore mines in the Lake Superior district, and coal mines in the Pennsylvania and West Virginia districts, have signified their intention of entering a steel merger, which, it is reported, will take place here soon.

Martins Ferry—Three hundred miners, employed by the Moore's Run Coal Co. in its operations west of this city, are on strike because of a claim that they are not getting full weight for coal mined. The men object to the "dumper" in use at the mine.

Pennsylvania

Bituminous

Washington—The Vesta No. 5 mine, at Fredericktown, idle for more than a year, has resumed operations. A large new tipple has been built and much modern machinery installed. Only about 225 men are to be employed; later a much larger force will be taken on.

Charleroi—It was reported here recently, on excellent authority, that negotiations have about been completed by which the Diamond Coal & Coke Co. will take over the coal holdings at Charleroi of the Pittsburg Plate Glass Co., known as the Charleroi Coal works. Twelve hundred acres of virgin coal land are included in the reported transaction. The purchase price is in the neighborhood of $1,250,000.

Pittsburg—The mines of the Pittsburg-Buffalo Co., at Marianna, Penn., have resumed operations, and immediate employment will be given to 500 additional men. The 200 coke ovens operated by the company at Marianna will be lighted and employment for more than 1100 men will be afforded next month. The mines now have a daily output of about 3000 tons, and this will be increased to 4000 tons next month.

The coal operators of western Pennsylvania, Ohio and Indiana decided at a joint meeting held here, Jan. 18, to accept the invitation of the miners to meet in Indianapolis, on Jan. 25, to negotiate a wage scale.

Colver—The construction work on the new tipple which the Link-Belt Co. has recently designed for the Ebensburg Coal Co.'s mine here, is well under way. This tipple will be one of the largest and most uptodate installations in this vicinity, being equipped with loaded and empty car hauls, shaking screens, rock conveyors, etc.

Anthracite

It has been announced that the Monongahela Coal & Coke Co. will this spring build a block of 23 houses near California for the employees of the Crescent mine.

Monongahela—The Dunkirk mine, of the Pittsburg & Westmoreland Coal Co., resumed operation recently, after being shut down for a month. Over 250 men are employed.

The Webster mine of the Henderson Coal Co. will be ready to run the latter part of this month.

Pittston—Firemen, ashmen and others employed about the Clarence colliery of the Hillside Coal & Iron Co., had a miraculous escape from injury or death, Jan. 12, when one of a set of five boilers at the colliery exploded, completely wrecking the fireroom and sending portions of the boiler flying for a distance of a hundred yards. At the time of the explosion the ashmen and firemen happened to be outside the fireroom.

Wilkes-Barre—Cold spells during December had the effect of keeping up the demand for anthracite coal and the price per ton averaged $4.89 during that month. This gives the mine workers an increase of 7 per cent. over the regular rate of wages. It will be applied on the January earnings. For the two months previous the sliding scale was 8 per cent., and the prospect is that January will witness another record-breaking demand for coal.

It is rumored here that the coal operators have decided to grant a general increase of 10 per cent. in wages to the miners at the expiration of their contract, on March 31. This will be the only concession the operators will make, but it is regarded as a stroke which will prevent any effort to strike. The offer will be made to the miners as soon as their demands are presented.

Shenandoah—Six miners were seriously injured, Jan. 12, when a box of dynamite caps exploded at the Knickerbocker colliery.

Washington

Ellensburg—What is believed to be the most important coal strike yet made in this state was recently reported here. Nine hundred feet of gangway have disclosed a seam from 14 to 20 ft. thick and a borehole 840 ft. deep shows nine distinct veins of good coal. The coal is apparently an excellent grade of bituminous and suitable for coking. Capital has been raised for development and a tipple will be built at an early date.

West Virginia

Parkersburg—A deal has been closed whereby the Spruce Park Coal Co. becomes owner of 3400 acres of coal land in Logan and Lincoln Counties, for a consideration of $250,000. C. H. Blair, of Philadelphia, president of the company, was in Parkersburg, to close the deal, and said the company already has made arrangements for leasing a large part of the land and will itself operate the remainder of the property.

Welch—The United States Coal & Coke Co., operating at Gary, McDowell County, lighted 1100 coke ovens recently, giving employment to a number of men at the ovens, and necessitating the employment of many more men in the mines, in order to provide the needed increase in output.

Keyser—The case of the Central R.R. of New Jersey against the Davis Coal & Coke Co., claiming $2200 demurrage on cars of coal shipped over its lines to tidewater after transfer from the Western Maryland R.R., was heard here, Jan. 19, and a settlement of $1925 agreed upon.

Fairmont—Full operations are being resumed in the Annabelle mines of the Pittsburg-Buffalo Co. at Annabelle, Marion County, and the Dorothy mine in Raleigh County will be operated to its full capacity. Two hundred men will be needed next month at each of the two mines. Contracts have been closed for the entire output of the coke ovens of the company during the present year. At Annabelle, 1000 tons a day is being mined. This will be doubled in February, and in a few months it will run at its capacity of 6000 tons a day. Dorothy mine will turn out 4500 tons daily within a few months.

Wyoming

Kemmerer—Five men were killed and 18 injured, Jan. 20, by a dust explosion in mine No. 4 of the Kemmerer Coal Co. The explosion occurred in what is known as the second north entry, 100 ft. from the main slope and 1000 ft. from the surface. The force of the explosion was confined and only those working in the immediate vicinity were injured. Miners in other portions of the mine made their way to the surface uninjured. The fans remained in operation and the afterdamp soon was cleared from the entries.

Canada

Nova Scotia—The Dominion Coal Co., one of the subsidiaries of the Dominion Steel Corporation, will soon have five new collieries in the Lingan district, the best coal section of Nova Scotia; two more in Morien and three others at Springhill, making 10 collieries added to 10 old ones. Expenditures for these and other additions will aggregate $5,475,000, of which $3,250,000 is still to be spent. Production this year is expected to total 4,500,000 tons of coal.

Alberta—A new discovery of coking coal has been made at Cardston, near Lethbridge, and a company has been organized under the name of the Cardston Coal & Coke Co., with a capital stock of $150,000, to develop the property. The company has secured leases and will commence work at once.

Personals

Dr. R. N. Mackey, formerly of the Moses Taylor Hospital, has accepted a position with the Red Cross Society and will be detailed in the near future for mining work, a special car being provided for his use.

Col. R. A. Phillips, general manager of the coal department of the Lackawanna R.R. Co., has published a book on "How to Prevent Mine Accidents." The book will be distributed to all Lackawanna mines for benefit of the employees.

Charles L. Fay, mining secretary, Pennsylvania State Y. M. C. A., was in Washington last week and secured Dr. A. J. Holmes, Director U. S. Bureau of Mines, as one of the principal speakers at the Y. M. C. A. state convention to be held, Feb. 22-25, at Bradford, Penn.

Earl Bradbury has returned to Rock Springs, Wyo., to assume the duties of assistant chief engineer for the Union Pacific Coal Co., to which position he has just been promoted. Mr. Bradbury has been stationed at Rock Springs at different times during his work with the company, but has recently been stationed at Hanna.

G. A. Burrell, chief chemist of the U. S. Bureau of Mines, Pittsburg, Penn., recently made a trip of inspection through Alabama and Tennessee. At Birmingham, Ala., Mr. Burrell visited the newly equipped state laboratory in company with Chief Mine Inspector Nesbit and made analyses of air from several Alabama mines.

Kuper Hood, well known in middlewest and southern coal circles, has been appointed general manager of the Thacker company, succeeding F. H. Benedict, who will remain with the company in an advisory capacity until April, when he will go to the Pacific Coast to settle permanently. Mr. Hood was formerly assistant manager.

William Griffith, mining engineer, Scranton, Penn., has been appointed one of a committee of five of the American Mining Congress to coöperate with the Secretary of the Interior regarding the most feasible plan for the development of mineral and coal lands in Alaska. Mr. Griffith has been engaged in development work in Alaska for several years.

John P. Walter, who for nine years has been chief engineer for the Pennsylvania Coal & Coke Co., at Cresson, Penn., has resigned and will sever his connection with the company, Apr. 1. Mr. Walter leaves with the best wishes of his associates for his future success and the deserved recognition of his employers of his ability in handling the problems that have confronted the coal company in its many operations.

Obituary

John Farrell, a first-aid man attached to the Bureau of Mines, was killed, Jan. 20, while examining the condition of a gaseous mine, at Cherry Valley, Penn.

John N. Luther, assistant general manager of the Spring Valley Coal Co., died suddenly, Jan. 17, at the Mercy Hospital, in Chicago, following an operation. Mr. Luther had been an official of the coal company nearly 20 years.

William Immenhort, Jr., assistant general manager of the Marmet-Hahn Coal Co., Columbus, Ohio, was drowned recently in the Ohio River. Mr. Immenhort, who was 35 years old and well known to the coal trade, was looking after the company's fleet of barges, which were at the time caught in an ice jam and in some danger of being carried away. He fell from one of the barges and his body was not recovered for several days.

Construction News

Harrisburg, Ill.—The O'Gara Coal Co., which has 17 coal mines in this county, is preparing to sink two new shafts east of Harrisburg, where options are held on coal under 3000 acres of land.

The Saline County Coal Co. is sinking a shaft two miles west of Harrisburg.

Glacier, Wash.—The Washington Anthracite Coal Co. is planning the erection of a tipple and complete surface works to handle the output of their mine here. H. O. Watrous, Glacier, is manager.

Washoe, Mont.—The Montana Coal & Iron Co. is taking bids for sinking a rock slope approximately 315 ft. long and on a 15-deg. pitch, on their property here. E. M. Cortright is engineer and W. W. Worthington, Washoe, is president of the company.

Brownsville, Penn.—George F. Hosack, president of the Cross Creek Coal Co. has awarded the contract for sinking two shafts near Burgettstown, to the Brownsville Engineering Co.; contract price, $90,000. The shafts are to be 270 ft. deep.

Birmingham, Ala.—The Pratt Consolidated Coal Co., of Birmingham, will expend $75,000 for improvements at its Flat Creek mines, the betterments to include a new prison, hospital and other accessories for about 300 convicts.

Charleroi, Penn.—The Monongahela River Consolidated Coal & Coke Co. will build 23 houses at its Crescent mine, California, Penn., and it is understood, will install a 150-hp. steam turbine at the Coal Bluff mine, Gastonville.

Beech, W. Va.—The Spruce Bend Coal Co. has just placed an order with the Link Belt Co., Chicago, for a car-haul and shaking-screen outfit to be furnished and erected complete at their mine.

New Publications

COLORADO SCHOOL OF MINES MAGAZINE FOR JANUARY, 1912. 22 pp., 6¾x10 in., 25c. Colorado School of Mines Alumni Association, Publishers, Golden, Colo.

PRODUCTION OF COAL AND COKE IN CANADA, 1910. By John McLeish, B. A. Bulletin of Department of Mines, Canada. Government Printing Bureau, Ottawa.

This is an advance chapter of the annual report on the mineral production of Canada, 1910, giving statistics of coal and coke production, exports and consumption for the calendar year 1910, and also for the past 30 years. Figures are tabulated and given by districts.

THE USES OF PEAT FOR FUEL AND OTHER PURPOSES. By Charles A. Davis. Bulletin No. 16, Bureau of Mines, 1911. 214 pp., 6x9 in., 1 plate. Free on request.

There are extensive and widely distributed deposits of peat in the United States, but until quite recently its production for fuel on a commercial scale has been accorded but little attention. This bulletin by Mr. Davis is a comprehensive treatise on the subject of peat in general, its formation, composition and uses, and on the origin and characteristics of its several forms. Processes for the preparation and manufacture of peat fuel are reviewed in detail, including such matters as the mechanical equipment of plants, costs, methods of operation and commercial possibilities. These data are necessarily acquired largely from the practice in European countries where the peat industry has reached a comparatively advanced stage of development. The use of peat in connection with gas producers is emphasized as giving particularly gratifying results, and its value as a raw material for other products than fuel is explained at some length by numerous examples. Tabulated analysis are given of samples of peat from practically every known area in the United States.

Trade Publications

General Fire Extinguisher Co., New York. Bulletin, "Grinnell" Automatic Sprinkler. 24 pp., 7¾x10½ in., illustrated.

Ingersoll-Rand Co., New York City. Bulletin, Form 4204, "Arc Valve" Tappet Rock Drills. 16 pp., 6x9 in., illustrated.

The positive quality of the valve movement in this drill renders it peculiarly useful when steam is used and when water of condensation is likely to be encountered. Catalog shows sectional views of drill and also gives list of duplicate parts, together with descriptive table of sizes and capacities.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The return of milder weather has effected a considerable change in market conditions. Transportation, while by no means back to normal, has improved materially; the result is that heavy tonnages are being moved. The mines have increased their output and there is again some evidence of surplus coal.

The movement to Atlantic coast ports has probably suffered the most and there is still a pronounced fuel shortage at these points. The railroads were tied up and water cargoes ice-bound, while the coal was frozen and difficult to handle; however, conditions now are much easier.

In Pittsburg and vicinity, the mines are working better time, and the production is heavy. Railroad service is still in bad shape, but improving, and the market is active, particularly in slack. The cold weather has cleaned up all free coal in Ohio and prices are stronger, especially in the smaller sizes, for which there is a heavy demand; weather conditions also affected transportation, especially on the Ohio River, where heavy losses, due to ice-floes, have been narrowly averted. The customary winter storing of slack, usually effective at this time in West Virginia and Tennessee, has not yet started because of the curtailed production at the mines.

In the Middle West, the situation, as regards supplies, is much improved, and the market is softer. The scarcity of coal, due to poor railroad service, has been relieved, and it is generally believed that continued warm weather will result in a heavy influx of standard sizes. In the West and on the Pacific Coast the trade is quiet and unchanged.

Boston, Mass.

Conditions early in the week bordered on distress for many of the shippers and dealers. Cargoes were ice-bound along the coast, and rivers and inlets ordinarily navigable were impassable. Spot deliveries of bituminous were therefore in demand and as high as $4.35 on cars, Providence, was paid for temporary supply. At Boston, many consignees have been on the ragged edge, but managed to pull through when milder weather let in some delayed arrivals. At the loading piers, dumping is slow because of frozen coal, and the whole market is decidedly irregular.

Water freights are the same as last week, $1@1.10, Hampton Roads to Boston, with premiums of 10@20c. for shoal boats. The rate to Providence is $1, and for New York loading 75c. has been paid. Shippers continue cautious over making charters.

The following are current prices for Pocahontas and New River steam:

Providence, on cars	$4.10@4.35
Boston, on cars	4.20@4.35
Shipments from Hampton Roads, f.o.b.	2.70

New York

The market here during the past week has been extremely active. Owing to the unusually cold weather, railroad transportation has been almost completely tied up for four or five days, with the result that the tonnage on hand at the piers has been gradually reduced. Coal at the piers is in a badly frozen condition so that there has been delays in loading of from three days to a week, which has made it difficult for shippers to satisfy the demands of their customers. This delay in loading at the piers has created a shortage in the supply of loaded coal; consequently water cargoes have commanded a considerable premium over f.o.b. coal, depending upon the urgency of the demand. Some loaded cargoes are reported to have sold as high as $3.40 alongside.

Car supply at the mines has been short all during this extreme weather so that it will be some time before the standing tonnage at New York is again at the normal.

There has been a strong demand for the higher grades of steam coals and all of these are practically out of the market for the present, as the shippers, without exception, have all they can do to take care of contract obligations. West Virginia steam coals f.o.b. New York are quoted from $2.55 to $2.65; ordinary Pennsylvanias $2.65 to $2.75, with the better grades out of the market.

Philadelphia, Penn.

While the weather has moderated considerably in this vicinity compared with the last week or two, the dealers continue to be quite busy in delivering orders. The offices of the local wholesalers are besieged with dealers, begging shipments on their orders for almost every size, particularly stove, chestnut and pea, which are in short supply. The streets, however, are now clear of ice, and the expensive deliveries have been eliminated.

The scarcity of certain sizes has resulted in pinching some of the dealers who have taken contracts at low prices with operators who have not been able to furnish them with the coal and they are compelled to pay considerably higher prices for the size required. One instance is noted of a concern having a contract to supply a hospital with buckwheat at a price of $1.15 at the mines, and it is understood that they were compelled to pay $1.50 at the mines for the coal. A number of instances of this kind occurred, and confirms earlier predictions that there would be a "squeeze" on some sizes before the winter season had passed.

The wholesale market was never better; even egg coal is no longer consigned to the storage yards, but applied on direct orders, and there is delay of two to three days in making shipments at that. Prompt shipment of any size at the present time is not promised, and on stove, chestnut and pea, orders have to take their turn; from one to two weeks elapse before even one car of these sizes will come out. Broken coal demand still exceeds the output, while the stocks of pea and rice have been entirely disposed of, and the production of these sizes is entirely inadequate to supply the market at the present time.

Pittsburg

Bituminous—Mine operations are being conducted to better advantage, as the severest of the cold snap is over. The percentage of operation is higher and coal movement is also much better, so that a fair supply is now being given to consumers. A disposition to stock up against the expected suspension of mining is beginning to be manifested, and the mines will have little difficulty in finding business to work up to the output the weather and shipping facilities will permit, from now to the end of March.

The coal market is steadier, fancy prices being less often paid. We quote: Nut, $1.05@1.10; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg.

Connellsville Coke—While there are signs that the movement of coke will loosen up, spot coke continues scarce and is commanding practically as high prices as at any time. In the past week sales of small lots of prompt furnace coke have been made at all the way from $1.85 to

$2, depending upon the exigencies of the case. It now appears as if the higher prices had come to stay, as operators are asking about the same range on contract coke.

The price situation is undoubtedly greatly helped by the prospect that there will be a suspension in the union districts Apr. 1, which would furnish a considerable market for Connellsville coal, the scarcity making up for the fact that Connellsville coal is at a freight disadvantage of 15c. a ton over the Pittsburg district. Operators would rather sell their coal at $1.10, at mine, than accept lower than present prices for coke. We quote: Prompt furnace, $1.85@2; contract furnace, $1.80@1.90; prompt foundry, $2@2.25; contract foundry, $2.10@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 13, at 391,432 tons, an increase of 68,000 tons, and shipments at 3620 cars to Pittsburg, 5051 cars to points West and 670 cars to points East, a total of 9341 cars, an increase of 250 cars.

Buffalo, N. Y.

There is a decided improvement in the demand for slack in the bituminous market, though the local trade is not offering it at a very uniform price. There is a certain lack of confidence in this trade, as a result of a long period of control by the consumer, that keeps most dealers from making a steady price and sticking to it.

The late holiday season was not over before there came on a week or more of severe weather, so that the output of all mines tributary to this market has been unusually light. In fact, the entire January output will be much smaller than anyone would have estimated, but the trade is not able to obtain any advance in prices. The expected stocking up against a possible strike does not materialize, which is a great disappointment also. In fact, the dealers as well as consumers are about agreed that the prospect of an April strike is small.

As a rule the orders on contract are more liberal than they were. The cold weather would alone insure an increase, and business is at least as good as it was last year. Quotations are therefore a little more confident at $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack. Coke is stronger at $4.25 for best Connellsville foundry and $3.50 for stock coke.

Cleveland, Ohio

Conditions in this market the past week have been rather serious on account of coal not being brought in by the railroads. Prices on all grades have increased in consequence, more especially in slack coal.

A number of mines in the Ohio district have not worked on account of the severe weather, which disabled their equipment, and the coal in transit has been delayed on account of snow blockades. In the past few days, however, the railroads have brought in considerable coal, which was quickly delivered to the customers, and now little is remaining on track and the prospects do not look bright for any large quantity coming in the next week.

Conditions, however, up to the present have not developed any serious shortage, but should the weather continue severe, there certainly will be a shortage in the next 10 days. Coal has been in transit from mines in West Virginia to this market for some 13 to 14 days, which should arrive here, when conditions are normal, in about four days. The same thing exists in the Ohio and Pennsylvania districts.

Columbus, Ohio

While the weather during the early part of the year was favorable for a good demand, it also interfered with mining and transportation, and now coal men are clamoring for higher temperatures. The change in the thermometer came toward the middle of last week and as a result conditions have improved.

The demand for domestic grades is still good and prices are ruling firm in every particular. There is also a good demand for the steam grades and as has been the case for some time prices for the small sizes are up. The fine-coal trade has been the feature of the market since the close of Lake navigation, and prices have steadily risen from 35 and 40c. until they are now 75 and 80c. Even at these prices fine coal is difficult to secure and many manufacturers are using mine-run instead. Retailers have been having a harvest, with prices strong and up to the usual winter level in many cases. There is also quite an appreciable increase in the requisitions of manufacturing establishments for steam tonnage.

Prices which prevail in Ohio fields are:

Domestic lump in Pomeroy Bend district	$1.65@1.75
Domestic lump in the Hocking Valley	$1.50
Three-quarter inch	1.35
Nut	1.15
Mine-run in eastern Ohio	1.00@1.05
Mine-run in the Hocking Valley	1.05@1.15
Nut, pea and slack	0.70@0.80
Coarse slack	0.60@0.70

Cincinnati, Ohio

The last week has been a strenuous one for the coal men in this market. To add to the ordinary troubles, such as tie-ups on the railroads, there has been a serious river situation which at this time threatens to parallel the excitement of several years ago when thousands of tons of coal were lost in the Ohio River by reason of ice gorges and later high water.

The extreme weather undoubtedly cleaned out any free coal that was on the market, but it is predicted that with the easier movement of coal resulting from the warm weather there will be another large amount of fuel ready for delivery and concerns which have been ordering more freely than they could store, in the hope that someone would be able to ship, will find themselves overstocked unless another cold snap should again relieve the situation. Such another extended cold spell would indeed put a keen edge on the market. The retail price of domestic fuel was advanced 25 to 50c. a ton, but this was due to the increased cost of delivery on account of the ice and snow. It was stated by dealers that even this did not nearly cover the added expense.

Charleston, W. Va.

Conditions have undergone no material change. The cold weather has continued to affect mining and shipping but prices for domestic are as good if not a little better than reported last week. With the breaking of the weather, however, production will increase and the output for the month will, in all probability, show a considerable increase over the same month last year, which was below the average.

A shortage of cars on the Kanawha & Michigan caused a shut down at nearly all the mines the latter part of last week and the early part of the present one. The shortage is reported to be due to a block on the lines in the Middle Western states, causing a slow return of the cars. The Kanawha & Michigan was the only line in West Virginia that during the past year caused any serious delays at the mines through car shortage. All the coal over this line, however, goes West and North—the lake points and Western markets.

Louisville, Ky.

The local coal situation remains practically unchanged. The flurry resulting from the record breaking cold spell, when dealers in both domestic and steam coals were pushed to the limit to supply the demands, passed away without any serious trouble. Prices are remaining unchanged and it seems now as if there will be little change before the drop which always accompanies the coming of spring. One thing seems certain and that is if the Louisville dealers can handle a situation such as that early in January, they will be able to meet most any condition which may develop this winter.

Nashville, Tenn.

One cold spell of weather continues to follow the other, and the conditions in the cities and towns in this district are critical. They are all practically out

of coal; there is no regular price and nearly anything is offered for spot shipments.

A bad shortage of cars was in evidence during this week on the L. & N., and this, together with freezing temperatures in the mining fields, was the cause of the entire district not being able to produce over 40 to 50% of its usual tonnage. The way it looks at the present time is that the only thing which can save the situation is at least one week of unusually mild weather accompanied by a good supply of empty cars for loading.

Screenings are still in big demand. This is the time of the year that many of the large users of screenings attempt to accumulate storage piles for the spring months when the mining of lump coal ceases. But it has been all that they could do to get enough to run from week to week; consequently they have accumulated nothing and will very likely find themselves in a bad fix this coming spring.

Indianapolis

The situation here has well nigh cleared up toward the close of the week. Of course, there is a stack of orders from the Northwest, to be filled as soon as possible. The commission found that the 16-hour law greatly hindered the railroad companies from rushing shipments. Under this law the crew may not work over sixteen consecutive hours.

Coal prices here and elsewhere in the state have been increased on an average of 25c. a ton. Local dealers say that the stock of coal is low, but they do not anticipate a famine.

Chicago

Milder weather has resulted in a softening of the market and a decline in the unusual prices that prevailed during the recent cold snap.

The full effect of the change is not yet apparent, but there are enough indications to demonstrate that a downward movement is well under way. Coal dealers do not expect a remarkable drop, but the decline, they say, will be of a substantial character.

A scarcity of coal has been one of the chief features in the recent market excitement. Service on the Chicago & Eastern Illinois has been crippled, and the Illinois Central has had thousands of cars of coal which it was unable to handle. Almost every effort to move smokeless coal in this market has been blocked at some junction point. Freight-traffic managers of Western roads say that with a rising temperature a heavy influx of coal in the Chicago market may be expected, and marked alterations in price schedules now in effect are sure to follow.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.62@2.87
Steam lump	2.37@2.87
Screenings	2.37@2.87
Springfield:	
Domestic lump	$2.57@2.82
Steam lump	2.32@2.82
Mine-run	2.32@2.82
Screenings	2.32@2.82
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.27@2.77
Mine-run	2.27@2.77
Screenings	2.27@2.77
Pocahontas and New River:	
Mine-run	$3.15@3.30
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.50@4.65; byproduct, egg and stove, $4.85; byproduct, nut, $4.55@4.65; gas house, $4.85.

St. Louis, Mo.

Conditions this week are somewhat on the order of last week, with the exception that the market has broken considerably. It is impossible to give any scale in prices, for, while Carterville opened at $2 for lump and egg, there were times when it went down to $1.65, and the Carterville sizes of nut were much on the same order, going at $1.60 as an average. Carterville screenings opened at about $1.25, but broke during the middle of the week, although indications are that they may go higher the latter part of the week. This same thing applies to Franklin County when it comes into St. Louis, but the past week or two has seen little of this coal in this market.

There is no Saline County nor Springfield coal coming in, and Murphyboro Big Muddy is hard to get at any price. The Mount Olive coals started out at about $1.90 at the mines, but has weakened some, as the demand is not as great, and coal is now moving freer.

Minneapolis—St. Paul

Cold crisp weather has continued throughout the present week, but has not been so severe as during the first two weeks of the month. A few cars of coal have been received at the various yards and some record-breaking time has been made in cleaning them up. Railroads are confiscating considerable coal for their own use. Hard coal is scarce, especially stove and the smaller sizes. Nut coal has not been sold as readily as in former years. Last year the price of nut coal was raised 25c. and dealers claim it had a tendency to stimulate the demand for other sizes.

Retail prices have not advanced any, with the exception of Pocahontas lump and egg, which advanced 25c. per ton, when the price at the docks was raised 50c. Wholesale prices at the docks are reported to be at circular. Illinois mines have all withdrawn price lists, and a number have no coal for sale at all.

Circular prices in the Twin Cities are as follows:

Anthracite	F.o.b. Dock	Minn.-St. Paul	Retail Delivered
Egg and stove	$6.50	$7.75	$9.00
Nut	6.75	8.00	9.25
Pea	5.25	6.50	7.75
Buckwheat	3.75	5.00	6.25
Pocahontas			
Lump and egg	5.00	5.90	7.50
Mine-run	3.25	4.15	5.50
Screenings	2.75	3.65	5.00
Sunday Creek Hocking			
Lump	3.50	4.40	5.75
Stove	3.50	4.40	5.75
Dock-run	3.10	4.00	5.35
Screenings	2.25	3.15	4.50
Youghiogheny			
Lump	3.50	4.40	5.75
Dock-run	3.20	4.10	5.45
Screenings	2.50	3.40	4.75
Smithing	4.25	5.15	6.50
Cannel (all rail)			8.00

Portland, Ore.

The cold spell that swept over this territory did not last long and as soon as it was over, the rush for fuel ceased with the melting of the snow and ice. So abrupt was the check on the business that dealers have seen fit to reduce coal values 50c. per ton, bringing the price on Australian and Rock Spring coals down to an even $10 per ton, including cost of delivery within the city. Bunker coal is quoted at 50c. less per ton, but there has been no demand for such coal here for some time. The coasting steamers are burning oil and the foreign steam craft that come here are either fully supplied or coal at British Columbia. Vessels in the oriental trade usually carry coal from the other side.

Production and Transportation Statistics

Chesapeake & Ohio Ry. Co.

The following is a statement of the coal and coke traffic over the lines of the Chesapeake & Ohio Ry. for November, and five months ending November, 1911, in short tons:

Destination	November	5 Months
Tidewater	284,872	1,603,154
East	200,002	869,036
West	825,597	4,798,682
Total	1,310,471	7,270,872
Coke	18,605	93,040
From Connections		
Bituminous	18,464	94,122
Anthracite	2,273	15,411
Grand total	1,349,813	7,473,445

Norfolk & Western Ry.

Statement of total coal and coke shipments over the N. & W. Ry. for December and the year 1911, in short tons:

Destination	December	Year 1911
Tidewater foreign coal	101,118	995,400
Tidewater foreign coke	5,713	75,867
Tidewater coastwise coal	293,850	3,084,674
Other domestic coal	1,413,644	15,363,913
Other domestic coke	116,988	1,434,985
	1,931,313	20,954,839

Ohio Coal Traffic Statement

Statement of bituminous coal mined in Ohio and shipped over railroads specified, November and first 11 months of 1910 and 1911, in short tons:

OHIO COAL TRAFFIC STATEMENT

Railroads	November		Eleven Months	
	1910	1911	1910	1911
Hocking Valley	465,215	444,543	4,301,978	3,306,526
Toledo & Ohio Central	218,601	204,767	2,007,069	1,743,903
Baltimore & Ohio	199,434	199,388	2,237,989	1,647,304
Wheeling & Lake Erie	356,010	392,082	3,459,033	3,353,577
Cleveland, Lorain & Wheeling	249,685	298,420	2,813,142	2,795,274
Zanesville & Western	109,976	124,261	1,088,447	1,048,866
Toledo Division, Pennsylvania Co.	209,006	196,708	2,069,139	1,743,890
Lake Erie, Alliance & Wheeling	142,448	122,326	1,166,382	1,142,741
Marietta, Columbus & Cleveland Ry	7,098	2,248	90,042	24,541
Wabash, Pittsburg Terminal Ry	7,155	1,072	62,071	53,097
Kanawha & Michigan Ry	.....	19,103	.....	104,747
Total	1,964,628	2,004,918	19,295,292	16,964,466

Coastwise Movement

Statement of domestic coal shipments by water from five principal Atlantic ports for November and first 11 months, 1910 and 1911, in long tons:

Ports	November	11 Months
New York	2,344,362	22,907,744
Philadelphia	617,832	6,444,082
Baltimore	246,186	3,904,028
Newport News	228,382	2,440,418
Norfolk (1)	423,040	4,214,834
Total, five ports	3,859,802	39,911,106

(1) Includes amount shipped by the Virginian Railway at Sewells Point, Va.

Exports

The total exports for November, 1911, were 2,122,753 tons, valued at $6,621,927, and for the first 11 months of the year 23,139,169 tons, valued at $71,377,595. These figures include bunker fuel laden on vessels in foreign trade.

Various Railroads, Rivers and Canals

Statement of coal and coke movement over different railroads, rivers and canals for November and first 11 months, for the years 1910 and 1911 was as follows, in short tons:

Imports

The total fuel imports for November, 1911, were 102,475 tons, valued at $299,443, and for the first 11 months were 1,101,228 tons, valued at $3,241,478.

Foreign Markets

Germany

The production, imports and exports of fuel in the German Empire for the first 11 months of 1911 was as follows, in metric tons:

	Production	Imports	Exports
Coal	147,309,185	9,958,356	24,806,125
Lignite	67,081,079	6,463,976	52,582
Briquettes	*20,029,757	195,984	2,236,907
Coke	23,025,879	549,013	4,079,834

*Including subsequently reported quantities.

Great Britain

The following is a comparative statement of the British exports for the years 1910 and 1911, in long tons:

	1910	1911
Anthracite	2,445,932	2,454,523
Steam	45,190,390	47,119,017
Gas	10,142,708	10,504,172
Household	1,549,735	1,540,710
Other sorts	2,776,711	2,980,844
Coke	964,053	1,064,839
Briquettes	1,470,791	1,612,741
Totals	64,520,320	67,276,846

The outlook in regard to the labor situation is serious, and strong conditions are in evidence in nearly all departments for early deliveries. For backward loading most sellers are inclined to hold their coal in the meantime. Quotations are approximately as follows:

Best Welsh steam coal	$4.32@4.44
Seconds	4.20@4.32
Thirds	3.84@3.96
Best dry coals	4.14@4.20
Best Monmouthshire	3.90@3.96
Seconds	3.66@3.72
Best Cardiff small coals	2.34@2.40
Seconds	2.16@2.22

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½% discount.

Spain

Imports of coal into Spain for the first 11 months of 1911 were 1,864,315 tons as compared with 1,828,108 tons for the same period in 1910. Coke imports for this period in 1911 were 293,841 tons as compared with 268,690 tons in 1910. Practically all imports are from Great Britain.

Financial Notes

Lehigh Coal & Navigation Co. has declared the regular quarterly 2% dividend, payable Feb. 29, to stock of record Jan. 31.

Jefferson & Clearfield Coal & Iron Co. has declared the usual semi-annual dividend of 2½% on preferred, payable Feb. 15 to stock of record Feb. 6.

The Dominion Coal Co. has declared the regular semi-annual dividend of 3½% on its preferred stock, payable Feb. 1 to holders of record Jan. 18.

The Colorado Fuel & Iron Co.'s charter expires on Oct. 21, 1912. Under the Colorado laws the company may apply for a 20-year extension on a vote of two-thirds of the stock outstanding.

The Pittsburgh Coal Co., contrary to expectations, earned the 5% dividend on the preferred stock in the fiscal year ended Dec. 31, 1911, according to officers of the company. Payment on the preferred dividend takes $1,353,590. In 1910 the earnings applicable to the preferred dividend amounted to $1,965,450.

The Reading Coal & Iron Co. has done an annual business of $35,000,000 without paying dividends. To a speculator this fact at once suggests large buried equities, since it is not conceivable that the coal company has been doing business without earning the same handsome margin of profit that other hard-coal concerns have made.

Joseph H. Hoadley, who is absolutely in control of the Alabama Consolidated Coal & Iron Co. as yet, is endeavoring to have $490,000 first consolidated gold 5s underwritten for the purpose of taking up and retiring the $426,000 first extension and improvement sinking fund gold 6s, which are held by the St. Louis Union Trust Co. as security for borrowed money. As the first-named bonds will probably not yield to the company more than 80, and the bonds which it is intended to retire with the proceeds of the sale are worth par, there will be a difference of $29,000 yet to be paid, which will be included in the general financing of the merged company, so it is said.

COAL AND COKE MOVEMENT OVER VARIOUS RAILROADS, RIVERS AND CANALS

Railroads	Month of November		Eleven Months	
	1910	1911	1910	1911
Baltimore & Ohio[1]	3,159,141	3,403,842	33,712,324	32,208,476
Buffalo, Rochester & Pittsburg[3]	746,010	750,748	7,438,306	7,497,928
Buffalo & Susquehanna[3]	170,115	178,649	1,580,855	1,768,103
Chesapeake & Ohio[1 2]	1,425,020	1,588,262	13,659,569	13,589,330
Erie[1 3]	581,166	667,786	5,805,619	6,678,894
Huntingdon & Broadtop Mountain[1 3]	100,478	101,593	1,150,281	1,012,111
New York Central & Hudson River[3]	703,777	723,061	7,194,792	7,351,102
Norfolk & Western[1 3]	1,698,876	1,962,155	18,427,493	19,021,526
Pennsylvania (east of Pittsburg and Erie)[1 4]	5,747,408	5,961,138	60,047,801	58,908,439
Pittsburg & Lake Erie[1 4]	1,472,209	1,440,529	16,483,283	14,846,979
Pittsburg, Shawmut & Northern[3]	127,956	139,538	1,146,812	1,323,184
Southern Railway[2]	378,886	350,290	3,564,793	3,156,688
Virginian Railway[1 3]	222,297	288,621	1,492,386	2,558,332
Western Maryland Railway	250,501	227,058	2,979,255	2,412,906
Rivers and Canals				
Chesapeake & Ohio Canal	22,112	22,568	184,882	186,440
Davis Island Dam	80,200	166,870	1,660,495	2,554,140
Monongahela River	683,247	810,348	8,703,580	8,296,493

[1] Includes coal received from connecting lines. [2] October and ten months' figures. [3] Includes company's coal. [4] Does not include company coal hauled free.